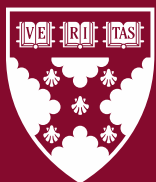


Working Paper 23-027

The Issuance and Design of Sustainability-linked Loans

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ABSTRACT

Sustainability-linked loans (i.e., syndicated loans for which pricing is linked to a sustainability performance indicator) have rapidly evolved into a significant private debt product. We find that sustainability-linked lending has been available mostly to borrowers with low ESG risk profiles. We show that borrower's ESG risk is associated with the use of aggregate (e.g., ESG score) rather than granular (e.g., carbon emissions) performance indicators and the monitoring by a reputable sustainability verifier. Further, ESG risk is unrelated to sustainability indicator materiality and target restrictiveness. Overall, we provide evidence consistent with the sustainability-linked lending market acting as a signaling mechanism of ESG credentials and being at the early stages of contract design sophistication.

Keywords: sustainability-linked loans, ESG-linked loans, credit market, ESG risk, KPI types

JEL Classifications: M41, G21, Q56

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1. Introduction

Performance pricing is a widespread contract design feature that links a loan's interest rate to borrower's credit quality. Prior studies have well explored the importance of performance-sensitive debt in mitigating agency costs and enhancing contract completeness (e.g., Asquith et al. 2005; Roberts and Sufi 2009; Costello and Wittenberg-Moerman 2011; Christensen et al. 2018). In a traditional corporate loan, performance pricing provisions employ current credit rating or accounting ratios (e.g., debt-to-EBITDA) as measures of a borrower's credit risk, with loan spreads increasing or decreasing when financial performance changes. However, over the past few years, the rise of sustainability-linked loans (*SLLs*, hereafter) has amplified the relatively small number of financial metrics commonly used in loan pricing grids (e.g., Skinner 2011). Specifically, this contractual innovation further ties a loan's interest rate to borrower's environmental, social or governance (ESG) performance indicators (*KPIs*, hereafter). Given the rapid annual growth of sustainability-linked lending by about 200% over the period 2017-2021, many industry commentators have raised concerns on whether this contract innovation can effectively incentivize borrowers to improve their sustainability outcomes and, if so, to what extent (Loan Syndicate and Trading Association [LSTA], 2022).

In this paper, we attempt to provide initial evidence on this topic by examining the ESG profiles of borrowers receiving *SLLs* and the design of such contracts. First, we focus on the relation between *SLL* issuance and borrowers' ESG risk. On the one hand, the inclusion of sustainability performance targets in the pricing grid may provide additional signals of borrowers' underlying credit riskiness and thus enhance contract completeness (e.g., Menz, 2010; Goss and Roberts, 2011; Schneider 2011; Chava, 2014; Hock et al. 2020). Relatedly, sustainability-linked pricing adjustments may be used by lenders to discipline borrowers' ESG activities and incentivize

them to improve underlying performance (Flammer 2021). We thus expect that SLLs will be primarily catered to high ESG risk borrowers. Under this prediction, lenders will select to contract on relevant, material and restrictive ESG metrics that can more efficiently capture borrowers' ESG performance. In turn, borrowers may accept more sophisticated sustainability KPIs as a credible signal of their costly commitment to improve their ESG quality (Li et al., 2016). Collectively, sustainability-linked pricing is likely prevalent among high ESG risk borrowers, with the selection of sustainability KPIs aiming at better monitoring them.

On the other hand, SLLs are likely a better fit for borrowers with more developed sustainability management practices that have allowed them to lower their ESG risk. Thus, borrowers will contract on sustainability-linked pricing to signal their ESG reputation (e.g., Garleanu and Zwiebel, 2009; Demiroglu and James, 2010; Manso et al., 2010) and differentiate themselves from other competitors (Ioannou and Serafeim, 2019). In addition, lenders may target low-ESG risk borrowers to mitigate monitoring costs related to disciplining high-ESG risk firms and thus mitigate reputational risks with respect to extending sustainability finance to poor-ESG-performing borrowers (Serafeim et al., 2022). Under this prediction, the link between KPI sophistication and borrower's ESG risk is not ex-ante clear. Although low ESG risk borrowers may incorporate relevant, material and restrictive KPIs to signal their commitment to ESG strategies, KPI characteristics may not be associated with underlying ESG risks for several reasons. First, reputable borrowers may leverage their bargaining power to draft on KPIs that do not overly increase their compliance costs. This argument is consistent with the high investor demand for ESG debt products and is supported by our discussions with credit analysts at Bloomberg and a large investment bank, suggesting that many sustainability-linked loans are driven by borrowers requesting from their banks to contract on sustainability KPIs that they use to evaluate their ESG

strategy. Second, lenders may perceive borrowers' sustainability risk over the relatively short maturity of syndicated loans (i.e., about five years) to be low, thus, selecting contractual mechanisms that can primarily alleviate the information costs with respect to screening and monitoring sustainability performance (e.g., Bozanic et al., 2018).

To address our research question, we employ a sample of 573 SLLs issued by 92 lenders to 494 borrowers over the 2017-2021 period. We identify details on loan contract terms in Bloomberg and the Newsfeed platform in Loan Connector, which includes credit analysts' coverage of loan issuance details.¹ To alleviate potential misclassification bias, we require that each loan's status is further verified by a press-release or an additional business press article.

We show that, over our sample period, the growth of sustainability-linked lending has largely outpaced the average increase in large corporate and green loan issuance (i.e., loans with use-of-proceeds towards green investments), reaching a size of about \$600 billion and constituting 14% of the annual corporate loan volume in 2021. Most sustainability performance targets focus on environmental metrics (e.g., carbon emissions, waste and water management), potentially reflecting the more advanced state of measurement for environmental indicators, relative to social (e.g., workplace safety, gender diversity), and the importance of climate change across various sectors (SASB 2021). The average loan includes two sustainability KPIs and a sustainability-linked pricing adjustment of five basis points. About 50% of the sustainability-linked loan syndicate structures include a sustainability coordinator, whose role is to determine and monitor the sustainability performance targets. Moreover, sustainability-linked lending activity remains highly segmented: only 30% of sample loans are underwritten by a top-five lead arranger within

¹ Typically, loan data in Loan Connector News are coded and transferred to DealScan, thus, information on loan contractual terms between these two datasets largely overlap. We collected loan data over the period February 2021-June 2021. We observe that non-standardized contract terms (e.g., sustainability target types, pricing adjustments) are not covered in detail in DealScan, thus, we directly hand-collected these terms from Loan Connector.

this market segment, and the median lender issues about 1-2 SLLs over the sample period.² In terms of geographic coverage, most deals have taken place in Europe.

In the first set of analyses, we investigate the ESG profiles of borrowers engaging in sustainability-linked financing. We obtain a control loan group by matching syndicated loans with sustainability-linked loans based on loan size, maturity, and borrower region, industry and public ownership status. We document that SLL borrowers have on average lower ESG risk proxied by borrower's ESG rating score provided by MSCI at the year of loan origination. Specifically, a decrease in ESG risk by one standard deviation increases sustainability-linked loan issuance by up to 10.6%. This evidence is consistent with the interpretation that this contract feature is primarily used by borrowers with more advanced ESG policies as a sustainability label to signal their type and that SLLs may be costly for borrowers with underdeveloped sustainability measurement and management. This finding further suggests that lenders consider reputational risks when selecting SLL borrowers.

We further provide evidence of the lower interest rates of sustainability-linked loans compared to similar loans issued by other borrowers. Specifically, sustainability-linked loans have on average up to 20% lower interest rate compared to other syndicated loans issued to borrowers of similar ESG risk. However, this result is not robust to controlling for borrower fixed effects or when benchmarking sustainability-linked loans to green loans. Collectively, these results lend support to the argument that SLL borrowers receive a significant pricing premium that is likely attributed to the higher ESG reputation and future prospects of these borrowers.

In the second set of analyses, we document that loans to high ESG risk borrowers are less likely to include granular (e.g., greenhouse gas emissions, workplace injury rate) rather than

² In comparison, top-five lead arrangers in the U.S. syndicate loan market accounting for about 60% of total loan issuance (e.g., Li, 2018).

aggregate (e.g., ESG score) sustainability KPIs, presumably because high ESG risk borrowers do not have high quality internal management accounting control systems for the measurement of sustainability KPIs. Specifically, an increase in ESG risk by one standard deviation decreases the probability of a loan including a granular KPI by up to 9.0%, i.e., about 19% of the variable's sample mean value. In addition, lead banks of sustainability-linked loans to high-ESG-risk borrowers will usually require external verification of target metrics by reputable sustainability coordinators, ESG rating agencies or public accounting firms. An increase in ESG risk by one standard deviation increases the probability of a loan syndicate including a reputable sustainability coordinator or external verifier by up to 8.8%, which represents 21% of the variable's sample mean value. Collectively, our findings suggest that lenders will employ contractual mechanisms that likely reduce information costs related to screening, measuring and monitoring ESG activities.

Furthermore, we find no evidence that ESG risk is associated with KPI materiality and relevance. Specifically, loans to borrowers with high environmental or social risk are no more likely to include an environmental or social KPI. In addition, about half of the SLLs include no KPI linked to SASB's Materiality Map, and the use of material sustainability KPIs is unrelated to borrower's ESG risk. To alleviate the concern that our results are driven by our choice of the ESG risk variable, we focus on the ratio of borrower's greenhouse gas emissions to total revenue as an alternative proxy. We continue to find that loans to borrowers with high greenhouse gas emissions are no more likely to include an environmental pricing target. Moreover, the findings are robust to using as proxy for ESG risk a sustainability rating score provided by a different rating provider (i.e., Refinitiv). In supplemental analyses, we further document that the mean restrictiveness of sustainability targets is about 7.4%. Borrower's ESG risk also appears not to influence target restrictiveness. This evidence suggests that lenders' incentives are likely centered on borrowers

meeting a sustainability target rather than incentivizing high ESG risk borrowers to make ambitious improvements.

Finally, we explore the association between a borrower's ESG risk and the pricing incentives included in sustainability-linked loans. We document no significant association between ESG risk and the pricing adjustments in sustainability-pricing grid. Moreover, we find no evidence of ESG risk determining whether the loan will include one- or two-way pricing adjustments (i.e., pricing incentive and penalty), thus, high ESG risk borrowers are no more likely to get a penalty for missing a sustainability target.

Collectively, our findings suggest that the sustainability-linked credit market segment typically attracts low ESG risk borrowers that are presumably interested in acquiring a sustainability label in their private debt issuance. Contractual features are mostly borrower-friendly without reflecting underlying material ESG risks or incorporating substantial pricing penalties if borrowers fail their contractually specified sustainability targets. Banks also seem to select contractual mechanisms that mitigate information costs related to monitoring and screening of sustainability activities.

Several caveats are in order. First, as sustainability-linked financing is only a recently introduced contract innovation, credit analyst coverage of this market segment remains limited and lending criteria are non-standardized, potentially giving rise to market experimentation and contract designs that may not be optimal for incentivizing sustainability risk management. In our conversations with multiple investment banks, interviewees commented that market participants are increasingly getting more sophisticated. Following the rising demand for sustainability performance-sensitive debt, investors will likely pressure lenders for greater transparency on the relevance and impact of sustainability-linked provisions. Thus, we caution against a normative

interpretation of our results, as institutional changes unexplored in this study may significantly affect our conclusions. Second, we document that borrowers are not subject to material pricing penalties for failing to meet contracted sustainability targets. However, we do not observe reputational costs that borrowers may incur and therefore, we may be underestimating the total cost of these penalties. Third, data limitations restrict us from establishing a causal link between sustainability-linked lending and credit terms and ESG risk, since we cannot observe lenders' due diligence efforts and loan underwriting negotiations.

Our paper builds on a number of important studies across a broad range of research areas. First, prior literature has examined the effect of borrower's sustainability performance on debt pricing and the use of financial covenants (e.g., Menz, 2010; Goss and Roberts, 2011; Schneider 2011; Chava, 2014; Shi and Sun, 2015; Anginer et al., 2021; Correa et al., 2022). Relatedly, sustainability performance has been shown to influence borrowers' credit ratings and default probability (e.g., Oikonomou et al., 2014; Hock et al. 2020). These papers overall propose that creditors consider borrower's sustainability efforts in their due diligence and loan underwriting process. Relatedly, a recent stream of literature has further investigated the role of environmental covenants in facilitating the monitoring of borrowers' ESG quality (e.g., Amiram et al. 2021; Choy et al. 2021; Lee and Zakota 2021). We extend this literature by introducing sustainability-performance pricing as a contractual innovation that aims at incentivizing borrowers to better measure, monitor and manage their ESG activities. Our paper complements two recent studies by Kim et al. (2022) who focus on the stock price reactions related to sustainability-linked loan announcements, and by Berrada et al. (2022) who examine the mispricing of sustainability-linked bonds. Both papers also investigate borrower's ESG risk following sustainability-linked debt issuance. Similarly, Dursun-de Neef et al. (2022) compare subsequent changes of ESG

performance of borrowers issuing sustainability-linked and green loans. Our contribution lies in exploring the contractual sophistication of sustainability-linked loans and documenting mostly borrower-friendly underwriting standards in structuring these deals.

Second, we add to the well-established literature of the importance of performance pricing provisions in signaling borrower's credit quality (e.g., Asquith et al., 2005; Beatty, Weber and Yu, 2008; Roberts and Sufi, 2009; Manso, 2010; Tchisty, 2016). We show that borrowers likely obtain a "sustainability label" in their private debt issuance, without committing to material sustainability indicators or costly pricing penalties if they fail to meet the contracted targets. In addition, our study contributes to the literature on contract completeness (e.g., Christensen et al. 2016), suggesting that extending the contractual space towards non-financial metrics can adversely affect contractual quality. Our findings thus support theoretical arguments on the drivers of contractual experimentation and innovation (Triantis, 2013; Coyle and Green, 2014) and contrast with prior evidence on the standardization of performance metrics largely used in loan contractual specifications (e.g., Dichev and Skinner, 2002; Skinner, 2011; Bozanic et al., 2018).

Lastly, we contribute to the rapidly growing literature on the use of ESG-related information by equity investors in monitoring portfolio's risk profile.³ Importantly, many studies point to the concern that ESG metrics often fail to capture material and relevant information about firms' underlying ESG activities (e.g., Khan et al., 2016; Amel-Zadeh and Serafeim, 2018; Raghunandan and Rajgopal, 2021; Serafeim and Yoon, 2022a; Serafeim and Yoon, 2022b; Christensen et al., 2022). Focusing on the use of ESG metrics in the credit market, we show that the targets commonly included in sustainability-linked loans may not pressure borrowers towards substantial and material ESG goals. These findings stand in contrast with prior papers documenting the positive

³ For instance, Cheng et al., 2014; Lins et al., 2017; Hartzmark and Sussman, 2019; Albuquerque et al, 2019; Albuquerque et al., 2020; Krueger et al., 2020; Bolton and Kacperczyk, 2021; Gibson et al. 2021; Grewal et al., 2021.

influence of other ESG debt instruments (i.e., green bonds) as an effective commitment mechanism towards ESG strategies (e.g., Flammer, 2021; Lu, 2021; Baker et al., 2022).

2. Data and sample construction

2.1. Sample of sustainability linked loans

We obtain our sample of sustainability-linked loans by focusing on the news stories covered in the web-based format of Refinitiv’s Loan Connector (LPC). The database, usually sold to academics in raw format as DealScan, features recent market activity and real-time coverage of loan pricing and structure, including detailed reports and analyses of loan contract characteristics by credit analysts. The population of news stories, though partially based on mandatory disclosures (e.g., annual reports) by public borrowers, is further amplified by credit analysts’ connections to bank managers.⁴ LPC is thus considered as the market leader for information on syndicated loans.

We identify reports pertaining to sustainability-linked lending by searching LPC’s web-based library for terms commonly used to describe this contract feature.⁵ We obtain 554 sustainability-linked loans issued over the 2017-2021 period. Although LPC is largely view as the dominant source of loan issuance data, sustainability-linked financing is a novel lending practice, thus, information coverage may be limited. To address this issue, we augment our sample with 117 loans labeled as sustainability-linked by Bloomberg. Next, we mitigate the concern that LPC or Bloomberg erroneously classify a loan as sustainability-linked by further employing press releases and business press articles to verify coverage accuracy. Thus, for each loan, we check whether it

⁴ Lenders have strong incentives to report new loan issuance to LPC in order to improve their placement in Gold Sheets’ league tables of lead arrangers. Ranking is based on quarterly volume and number of loan deals and is used by banks as a marketing component to increase their clientele. With respect to sustainability-linked financing, LPC issues monthly reports of new loan issuance with green contract features (“The Green Lending Review”), which is distributed to banks and credit analysts. Given the recent interest in this credit market segment, lenders are further incentivized to report sustainability-linked loans to LPC to enhance their reputation.

⁵ We collect sustainability-linked loan data over the February-June 2021 period. Specifically, we search for the following terms: “ESG,” “sustainability,” “environmental,” “social,” “governance,” “CSR,” “SLL,” “greenhouse,” “emissions,” “GHG,” “diversity.”

is also identified as sustainability-linked in at least one different data source. We eliminate 27 and 71 loans in LPC and Bloomberg, respectively, for which sustainability-linked status cannot be further verified. Our final sample includes 573 unique loans issued to 494 borrowers. The sample selection process is summarized in Table 1, Panel A. As we further discuss in Section 2.3, comparing annual sample loan issuance with descriptive statistics in industry reports (e.g., Bloomberg 2021), our sample closely captures the population of sustainability-linked loans.⁶

We next collect loans' sustainability features from LPC news stories, including sustainability key performance indicators, sustainability coordinators, pricing adjustments, sustainability raters and auditors.⁷ We further obtain data on loan size, all-in-drawn spread, maturity, covenants, tranche types, collateralization, borrower credit rating, and amendment status.⁸ We retrieve SEC filings for 65 loan contracts from EDGAR. Appendix A presents examples of sustainability-linked pricing provisions extracted from SEC filings. Finally, we obtain borrower financials from Orbis and ESG rating scores from MSCI, the dominant source of ESG rating information globally that ESG investors commonly use (e.g., Serafeim and Yoon 2022, Serafeim et al. 2022). Sample size varies in the empirical tests depending on data availability. For example, in the tests for the relation between KPI characteristics and our proxies for borrowers' ESG risk, our sample decreases to 388 observations, because few sample borrowers are not rated by an ESG rating agency.

2.2. Control groups of loans

We examine the likelihood of sustainability-linked financing employing a control loan group that we obtain in DealScan by matching syndicated loans with sustainability-linked loans based

⁶ Bloomberg Green Finance, "The Sustainable Debt Market Is All Grown Up", January 14 2021.

⁷ Although sustainability-linked loans are also included in DealScan, we note that detailed information on sustainability terms are not covered. Thus, using LPC stories allows us to parse granular SLL characteristics not commonly provided in DealScan.

⁸ For the 71 sustainability-linked loans extracted from Bloomberg, we use sustainability term data as reported in Bloomberg raw database.

on loan size, repayment horizon (maturity), borrower region (Asia, Europe, Latin America, North America, Oceania and Other) and industry (GICS 11-industry classification), and whether a borrower is a public firm.⁹ The one-to-one matching of sustainability-linked loans is done in random order and without replacement. Matched loans are within a distance (“caliper”) of 0.01 of the propensity score of the loans in the treatment group. We also condition that matched loans are not originated by sustainability-linked borrowers.

In robustness checks, we further obtain a control group of green loans issued over the 2017-2021 period by focusing on the “market segment” loan classification in DealScan (575 green loans). Green loans restrict borrowers in using the proceeds to exclusively fund projects with a substantial environmental objective. Borrowers are further obliged to communicate to their lenders their sustainability criteria and annually report fund allocation towards green projects (LSTA, 2022). Green loans have been the primary instrument to monitor borrowers’ environmental activities in the loan market, reaching a total issuance volume of about \$80 billion in 2020 (Bloomberg 2021).

2.3. Overview of sample

Over the past four years, the rise of sustainability-linked financing has gained significant momentum, with a mean annual issuance of about \$117 billion. Sustainability-linked pricing provisions have rapidly evolved as a substantial contract design feature in the large corporate loan market, with about 14% of loans underwritten over the first half of 2021 including this term (Figure 1). Importantly, despite the recent credit contraction following the Covid-19 pandemic, sustainability-linked loan issuance remained strong, reaching \$240 billion by June 2021 and

⁹ “Other” region is assigned to borrowers in Egypt, Ghana, South Africa and United Arab Emirates.

significantly outpacing the growth rate of green lending (Figure 2).¹⁰ About 80% of the sustainability-linked loan issuance volume concerns investment-grade borrowers (Bloomberg, 2021).¹¹ The growth in sustainability-linked lending has been fueled by the increasing lender and investor demand for loan portfolios with a sustainability component, offering them with a contractual mechanism to hold borrowers accountable for their sustainability goals, and potentially mitigate credit risks to the extent that sustainability risks translate to financial risks (Milbank Insights 2022; Serafeim et al. 2022). To bolster borrowers' and lenders' confidence in sustainability-linked lending, in 2019, the LSTA developed the Sustainability-linked Loan Principles (SLLP), which include guidelines for KPI measurement, materiality, target ambitiousness and reporting.

Table 1 provides additional descriptive statistics of sustainability-linked loans. We show that sustainability-linked financing typically relies on a diverse set of ESG objectives (Panel B).¹² Although lenders are more likely to contract on environmental performance indicators, there is a significant variation across the specific metrics employed within a broader ESG category. To exemplify, environmental performance indicators mostly include greenhouse gas emissions and energy management (270 and 133 performance indicators in our sample loans, respectively), however, circularity and waste management, supply chains and water management are also frequently used as KPIs. This fact likely depends on the more advanced state of measurement for environmental indicators, relative to social, and the importance of climate change for many sectors of the economy (SASB 2021). Interestingly, a substantial number of sustainability-linked

¹⁰ Loan amendments are unlikely to significantly influence the recent growth of sustainability-linked financing. In untabulated summary statistics, we find that the percentage of sample loans amended to include a sustainability-linked pricing provision drops from about 44% in 2017 to 22% in 2020, remaining almost flat in the first half of 2021.

¹¹ Bloomberg Green Finance, "U.S. Sustainability-Linked Loans Are 292% More Than All of 2020," May 24 2021.

¹² Indeed, the collection of contract terms yielded an initial set of 41 different KPI categories. We follow the ESG issue classification of the Sustainability Accounting Standards Board (SASB) to group the different sustainability performance indicators in our sample loans. A more granular presentation of the KPIs is included in Appendix B.

provisions rely on an aggregate ESG score metric—typically provided by an independent ESG rating agency—without including a granular specific KPI. Moreover, sustainability-linked loans can also include social sustainability goals (e.g., diversity, workplace accidents), likely reflecting the diverse sustainability goals borrowers commonly have across various sectors.

Indeed, while the prevalence of environmental KPIs can be attributed to this contractual innovation being adopted by borrowers in sectors looking to decarbonize (e.g., industrials, utilities and real estate), we note that sustainability-linked financing has been widely spread across different industries (Panel C). Although a significant portion of sustainability KPIs seem to map material ESG objectives within an industry (SASB 2021), many SLLs include different types of sustainability goals. For instance, while pricing provisions in loans to borrowers in utilities or real estate mostly include an environmental performance KPI reflecting the materiality of environmental goals in these sectors, loans to borrowers in this industry are also written on social or aggregate ESG metrics. Overall, this evidence indicates that sustainability KPIs remain a non-standardized contract feature, and lenders—to some extent—likely experiment in sustainability contract design. Moreover, the variability of SLLs’ KPIs may also reflect the different sustainability metrics that borrowing firms use to measure their ESG strategy outcomes.

In terms of geographic coverage (Panel D), consistent with a focus on sustainability objectives being more prevalent among European firms, most sustainability-linked deals take place in Europe (377 loans), with some activity also being present in North America and Asia (85 and 82 loans, respectively). We further show that European sustainability-linked loans are less likely to include an aggregate ESG metric compared to those issued in Asia or North America, likely attributed to the greater importance and advancement of sustainability strategies by European firms (Ioannou and Serafeim 2012; Grewal et al. 2018). Moreover, although sustainability-linked loans include

on average two performance indicators, we find that this number increases over our sample period (Panel E). Interestingly, recent sustainability-linked loans are more likely to incorporate environmental or social indicators with the use of aggregate ESG scoring gradually decreasing, consistent with the interpretation that contractual sophistication of sustainability-linked loans has improved over the sample period.

Lastly, we show that the sustainability-linked loan market remains highly segmented. Top lead arrangers in sustainability-linked financing account for only 30% of total loan issuance (Bank of America, BBVA, BNP Paribas, JP Morgan and ING Bank) (summary statistics presented in Table 2). Consistent with borrowers' investment-grade credit rating, most SLLs are originated by or distributed to large banks. About 50% of the sustainability-linked loan syndicates include a sustainability coordinator, whose role is to determine and monitor the sustainability performance indicators.¹³ To exemplify, among the 60 unique banks acting as sustainability coordinators in our sample loans, BBVA, BNP Paribas, Credit Agricole, ING and Rabobank are among the most active lenders, underwriting about 27% of the sample loans (untabulated summary statistics). Moreover, lead arrangers may also request sustainability performance indicators to be verified by an independent rater or auditor (e.g., Vigeo Eiris, Sustainalytics, Big Four public accounting firms). Sample lenders obtain ratings or external verification of the performance scores from 53 ESG rating agencies or auditors. About 70% of SLLs outstanding include a sustainability coordinator or are audited by an external consultant or ESG rating agency (untabulated). Overall, this evidence suggests that the sustainability-linked loan market landscape remains, so far, highly competitive.

¹³ In the absence of a sustainability coordinator, the lead arranger decides upon and monitors a loan's sustainability performance indicators.

3. The economics of sustainability-linked lending

Based on the framework outlined above, many industry commentators and investors have raised concerns whether this contractual innovation effectively motivates borrowers to monitor, measure and enhance their ESG activities, or is linked to borrowers' incentives to acquire a sustainability label in their private debt issuance without sufficiently robust or relevant KPIs (LSTA, 2022). We attempt to shed light on this topic by examining the SLL borrower type and contract design. Our empirical analyses are organized across two research questions. First, what type of borrowers are more likely to receive sustainability-linked financing? Second, how does a borrower's ESG risk determine the characteristics of sustainability performance indicators and pricing incentives?

On the one hand, lenders may employ sustainability-linked pricing as a contract feature that can alleviate moral hazard and adverse selection costs with respect to borrowers' ESG activities. This argument is consistent with prior studies that document an inverse relation between ESG risk and credit riskiness (e.g., Menz, 2010; Goss and Roberts, 2011; Schneider 2011; Chava, 2014; Hock et al. 2020). Although lenders can employ alternative contractual mechanisms to monitor borrowers' ESG risk (e.g., environmental covenants), enforcement of creditor rights concerning borrowers' ESG actions may be costly. Thus, sustainability-linked pricing can provide lenders with greater bargaining power and direct risk compensation when a borrower's ESG risk deteriorates (e.g., Asquith et al., 2005; Roberts and Sufi, 2009). In addition, by incorporating interest rate discounts, sustainability pricing adjustments are likely to incentivize high-ESG risk borrowers to undertake necessary investments to reduce ESG risk, thus, providing a contractual mechanism for lenders to discipline and monitor borrowers' commitment towards ESG activities (Flammer 2021). We therefore expect that sustainability-linked financing will be more prevalent

among high ESG risk borrowers.

In turn, lenders will further select to contract on granular, relevant and material sustainability KPIs that can effectively signal borrowers' efforts in improving ESG strategies and pressure them to better measure and monitor underlying performance metrics. Similarly, high ESG risk borrowers may also accept material, relevant and restrictive KPIs as a costly commitment to enhance their quality and signal to lenders their future prospects (Li et al., 2016). Collectively, under this prediction, sustainability-linked pricing is likely introduced to mitigate moral hazard and adverse selection costs arising from borrowers' ESG activities, with the selection of sustainability KPIs aiming at better monitoring these problems.

On the other hand, sustainability-linked pricing is likely employed in loan contracts to firms with low ESG risk, in line with the argument that borrowers will select contractual features to signal their underlying reputation (e.g., Garleanu and Zwiebel, 2009; Demiroglu and James 2010; Manso et al., 2010) and differentiate themselves from other competitors (Ioannou and Serafeim 2019). In addition, lenders may target low-ESG risk borrowers to mitigate monitoring costs related to disciplining high-ESG risk firms and thus mitigate reputational risks with respect to extending sustainability finance to poor-ESG-performing borrowers (Serafeim et al., 2022). The extent to which borrowers and lenders use this contract innovation to obtain a "sustainability label" in private debt issuance, the link between the contractual sophistication of sustainability KPIs and borrower's ESG risk is not ex-ante clear. Although low ESG risk borrowers may incorporate relevant, material and restrictive KPIs to signal their quality and commitment to ESG strategies, sustainability KPI characteristics may not be associated with underlying ESG risks for several reasons. First, since this contractual innovation was only recently introduced in the private debt market, the lack of standardization together with rising investors' demand for ESG-labeled debt

may increase borrowers' bargain power, leading to the issuance of sustainability-linked loans with contractual terms that do not overly increase borrowers' compliance costs. This argument is further supported by our discussions with credit analysts at Bloomberg and a large investment bank, who suggest that many sustainability-linked loans are primarily driven by borrowers requesting from their banks to add in the loan's pricing grid the sustainability KPIs that they use to evaluate their ESG strategy, without lenders further disputing the relevance or adequacy of these terms. Second, lenders may perceive borrowers' sustainability risk over the relatively short maturity of syndicated loans (i.e., about five years) to be low, thus, selecting contractual mechanisms that can alleviate the information costs with respect to screening, monitoring or renegotiating sustainability KPIs (e.g., Bozanic et al., 2018). Thus, the selection of sustainability KPIs may be unrelated to underlying ESG risks.

4. Variable definition and summary statistics

We divide the variables used in our empirical tests into measures of borrower characteristics, sustainability performance indicators and pricing incentives, and loan contract terms. These variables are described below, and Appendix B includes their detailed definitions. In Panel A of Table 2, we present summary statistics for the variables, and Spearman correlations are reported in Panel B.

4.1. Borrower performance

We capture borrowers' ESG risk by their ESG rating score in the year of loan origination provided by MSCI. The database is the dominant source of ESG rating information globally and is commonly used by ESG investors in their portfolio allocations (e.g., Serafeim and Yoon 2022,

Serafeim et al. 2022).¹⁴ MSCI rates firms' ESG performance in a scale of 0 to 10, with higher values indicating better management of sustainability risk exposures. We define *ESG risk* as ten minus a borrower's weighted average ESG pillar score. We employ the weighted average rather than the equally weighted ESG score in our analyses to account for the importance of environmental, social and governance performance indicators across different sectors and borrowers. We further consider the industry-adjusted weighted average ESG pillar score to capture lenders' industry-specific views of ESG risk across the sectors they engage in. *ESG risk, industry adjusted* is defined as ten minus a borrower's industry-adjusted weighted average ESG pillar score. The mean *ESG risk (ESG risk, industry adjusted)* is 4.5 (3.8). Related to our discussion in Section 3, we expect that moral hazard and adverse selection problems with respect to borrowers' ESG activities will be positively (inversely) related to ESG risk (ESG rating score).¹⁵

We further control for several measures of borrower's financial performance obtained from Orbis: total liabilities to total assets (*Leverage*), earnings before interest and taxes to total assets (*ROA*), and the natural logarithm of total assets (*Total assets*). We further use an indicator variable of whether a borrower is a publicly listed firm (*Public borrower*). The mean *Leverage* and *ROA* is 60.6% and 4.4% respectively, and the mean borrower size is about \$24 billion (log-transformed values are shown). About 70% of the sample loans are issued to publicly listed borrowers.

4.2. Sustainability performance indicators

We test for the relation between firms' ESG risk and SLL contractual sophistication by focusing on two important features of sustainability performance indicators: verification and

¹⁴ "MSCI ESG Ratings aim to measure a company's resilience to long-term, financially relevant ESG risks (...) The rating model focuses only on issues that are determined as material for each industry (...) (MSCI) uses a rules-based methodology to identify industry leaders and laggards according to their exposure to ESG risks and how well they manage those risks relative to peers" (MSCI ESG Ratings Methodology 2022).

¹⁵ We further test whether our primary findings are robust to using an alternative proxy for ESG risk using rating scores by Refinitiv. We discuss these tests in Section 5 and present selected findings in Table C2 of Appendix C.

materiality. We consider two dimensions of KPI verification: KPI granularity and external monitoring. The use of granular specific KPIs (e.g., GHG emissions, board diversity) rather than aggregate outcome-based KPIs (e.g., ESG score) allow for a direct measurement and evaluation of borrowers' sustainability efforts. *KPI Granularity* is an indicator variable of whether a loan includes only granular sustainability performance indicators (environmental, social or governance). The probability of loan pricing being solely linked to a granular sustainability performance KPI is 46.8%, thus, only about half of SLL outstanding include specific indicators.

We capture external monitoring using an indicator variable of whether an SLL includes: (i) a top-five sustainability arranger (measured by SLL issuance volume) in its syndicate structure, or (ii) KPIs verified by a reputable external consultant or rating agency (*Top Sustainability verifier*). These include the Big 4 accounting firms (PwC, EY, KPMG, Deloitte) and firms with significant market presence in ESG data and analytics (Vigeo Eiris, Sustainalytics, GRESB, ISS, S&P, MSCI, RobecoSam, Dow Jones and FTSE Russell). Reputable sustainability arrangers include BBVA, BNP Paribas, Credit Agricole, ING and Rabobank. The mean *Top Sustainability verifier* is 42.1%.

We test for the materiality of sustainability KPIs by examining the relation between a borrower's environmental and social performance and the use of a relevant KPI. *KPI Environmental indicator* and *KPI Social indicator* are indicator variables of whether a loan includes an environmental or social performance indicator, respectively. The sustainability KPI classification is presented in Panel B of Table 1. The probability of a loan including an environmental or social KPI is about 57.4% and 27.4%, respectively. Next, we explore the use of a material sustainability KPI using SASB's Materiality Map. *KPI Materiality* is an indicator of whether a loan includes an environmental, social or governance KPI classified as material under the SASB Materiality Map, and *KPI Materiality (pct.)* is the ratio of the number of material

environmental, social or governance KPIs under this classification, deflated by the total number of KPIs. The likelihood of a loan including a material KPI is 47.6%, suggesting that only about half of the sustainability-linked loans outstanding include at least one material KPI based on SASB's classification. In addition, about one-third of the KPIs included in the sustainability performance-pricing grid can be considered as material under the same classification (the mean *KPI Materiality (pct.)* is 34.5%). To mitigate the concern that our results of KPI materiality can be attributed to defining ESG risk based on ratings by ESG rating agencies, we examine whether loans to borrowers with high greenhouse gas emissions are more likely to include a relevant environmental KPI. *Scope 1 and 2 emissions (Scope 1, 2 and 3 emissions)* is the ratio of a borrower's GHG Scope 1 and 2 (i.e., direct and indirect) emissions (GHG Scope 1, 2 and 3, i.e., direct, indirect and other emissions related to upstream and downstream operations), deflated by borrower's operating income. We obtain GHG emission data from the CDP data, commonly used by data providers and investors around the world (Ioannou, Li and Serafeim 2016). The mean *Scope 1 and 2 emissions (Scope 1, 2 and 3 emissions)* is about 4.0% (12.6%).

4.3. Sustainability performance pricing incentives

We include several variables to examine the pricing incentives commonly employed in sustainability-linked loans. We first consider whether lenders offer only favorable pricing terms for meeting sustainability KPIs without penalizing borrowers for missing sustainability performance milestones. *DecRate SPP* is a binary variable equal to one if a loan includes a decreasing one-way sustainability performance pricing provision, zero otherwise. The majority of loans include a pricing increasing and decreasing provision based on sustainability KPIs, and about 24.6% of our sample loans include only positive incentives for meeting sustainability KPIs.

Second, we use the adjustment to interest rates when borrowers meet (or miss) a sustainability

target. *SPP Margin adjustment* is the absolute value of all-in-drawn spread adjustment (in basis points, excluding fees) based on sustainability performance target thresholds. For SLLs with multiple sustainability pricing adjustments based on different performance target thresholds, we use the maximum sustainability pricing adjustment in the contract. Relatedly, we further proxy for the range of sustainability spread adjustment (*SPP Margin adjustment range*), controlling in our multivariate tests for whether a loan includes an increasing or decreasing one-way sustainability performance pricing provision, zero otherwise (*One-Way SPP*). The mean spread adjustment (range adjustment) is about 4.8 basis points (8.6 basis points). About 25.1% loans include a one-way pricing adjustment.¹⁶ For an average loan of \$1 billion and five years maturity, the sustainability-linked pricing adjustments represent approximately \$4.1 million in interest expenses.¹⁷

4.4. Loan characteristics

In our multivariate tests, we use loan pricing and non-pricing terms obtained from Loan Connector and DealScan, including the natural logarithm of a loan's all-in-drawn LIBOR-spread (*Loan margin*), an indicator variable of whether a loan includes a financial or net worth covenant (*Loan covenant*), and an indicator variable of whether a loan is collateralized (*Loan collateral*). We further control for the natural logarithm of loan size (*Loan size*), the natural logarithm of loan maturity (*Loan maturity*), an indicator variable of whether a loan includes a revolving tranche (*Revolving tranche*), an indicator variable of whether a loan is an amendment (*Loan amendment*), the number of sustainability performance indicators in a loan's pricing grid (*Number of KPIs*) and an indicator variable reflecting whether a loan is underwritten by a top-five lead arranger

¹⁶ The majority of loans include a spread incentive and penalty for meeting or missing a target. When loans include a one-way pricing adjustment, this typically only decreases interest rate when a milestone is achieved.

¹⁷ The range in interest expense corresponds to the net present value of five annual payments using LIBOR as a discount rate. The LIBOR rate averages 1.51 percent per year during our sample period.

(measured by sustainability-linked loan issuance volume) (*Top SLL lender*). Reputable ESG lenders include Bank of America, BBVA, BNP Paribas, JP Morgan and ING.

The mean LIBOR-spread is 162 basis points (log-transformed values are shown), and 16.9% and 14.1% of the sample loans are secured and include a financial covenant, respectively. These summary statistics indicate a low credit risk of sustainability-linked loan borrowers. About 25.0% of the sample loans are amendments. The mean loan amount is \$1 billion, and the average sample loan matures in five years (log-transformed values are tabulated). We note that the higher mean loan size is further consistent with sustainability-linked loan borrowers' reputation and credit risk profile (the mean syndicated loan amount is about \$400-\$500 million). The probability of a reputable-lender loan is 30.2%, and 61.8% of the loans include a revolving tranche. Sample loans include on average two sustainability performance indicators.

5. Research design and empirical results

5.1. Sustainability-linked lending and borrowers' ESG risk

To examine the association between sustainability-linked lending activity and borrower's ESG risk, we employ a probabilistic model where the dependent variable is an indicator of whether the loan includes a sustainability-linked pricing grid (*Sustainability-linked loan*).

$$\begin{aligned}
 Prob(SLL=1) = & \alpha + \beta_1 ESG \text{ risk} + \beta_2 Public \text{ borrower} + \beta_3 Loan \text{ size} + \beta_4 Loan \text{ maturity} \\
 & + \beta_5 Loan \text{ amendment} + \beta_6 Loan \text{ collateral} + \beta_7 Loan \text{ covenant} \\
 & + \beta_8 Revolving \text{ tranche} + \beta_9 Total \text{ assets} + \beta_{10} ROA + \beta_{11} Leverage \\
 & + Year \text{ of loan origination } FE + Borrower \text{ region } FE \\
 & + Borrower \text{ industry } FE + Loan \text{ purpose } FE.
 \end{aligned}
 \tag{Model 1}$$

The independent variable of interest is *ESG risk* (or *ESG risk, industry adjusted*). We control for credit and borrower characteristics that may affect sustainability-linked lending as well as for loan origination year, borrower industry (GICS 11-industry classification) and region (Asia, Europe, Latin America, North America, Oceania, Other) fixed effects to capture differences in

sustainability-linked financing over time and across industries and geographies. We further use loan purpose fixed effects (financing, investing, operations, other) to control for differences in loan proceeds allocation. Variable definitions are included in Appendix B. Standard errors are clustered at the borrower level.¹⁸

Our control loan group includes syndicated loans matched with the sample of sustainability-linked loans using a propensity score matching methodology based on size, maturity, year of loan origination, borrower's total assets, region and industry and whether the borrower is a public firm. The one-to-one propensity score matching of treated loans is done in random order and without replacement. Matched loans are within a distance ("caliper") of 0.01 of the propensity score of the loans in the treatment group. Details for obtaining our matched loan sample are further discussed in Section 2.2.

We report the results of these tests in Table 3. Panel A shows that our matching methodology achieves a strong covariate balance. In Panel B, we find that SLL borrowers have on average lower *ESG risk* (specifications 1 and 2), using a matched sample of syndicated loans and controlling for loan features and borrower financial performance. To exemplify, a decrease in *ESG risk* by one standard deviation increases sustainability-linked loan issuance by about 10.6%. The results are similar when using *ESG risk, industry adjusted* as a measure of ESG performance (specifications 3 and 4). A decrease in *ESG risk, industry adjusted* by one standard deviation increases sustainability-linked loan issuance by about 9.2%. This evidence suggests that sustainability-linked lending activity is more pronounced among borrowers with low ESG risk, consistent with the view that this contract feature is primarily used by borrowers with advanced ESG policies as a sustainability label to signal their quality. This finding further suggests that lenders likely consider

¹⁸ The results of the empirical analyses remain unchanged when clustering standard errors by lead arranger or borrower's industry (untabulated robustness check).

reputational risks when selecting SLL borrowers.

The coefficients on the control variables are also consistent with our expectations. Sustainability-linked loans are mostly unsecured and include a revolving tranche, indicating that sustainability pricing is commonly used among low-credit-risk borrowers. Moreover, we show that sustainability performance pricing grids are typically added to loan contracts in the amendment process. Specifically, loan renegotiations increase the likelihood of augmenting contractual features with ESG pricing targets by about 60%.

5.2. Sustainability-linked lending and loan pricing

We next investigate the pricing of sustainability-linked loans. To do so, we employ an ordinary least squares (OLS) model where the dependent variable is the natural logarithm of a loan's all-in-drawn LIBOR-spread (*Loan margin*).

$$\begin{aligned} \text{Loan margin} = & \alpha + \beta_1 \text{Sustainability-linked loan} + \beta_2 \text{ESG risk} + \beta_3 \text{Public borrower} \\ & + \beta_4 \text{Loan size} + \beta_5 \text{Loan maturity} + \beta_6 \text{Loan amendment} + \beta_7 \text{Loan collateral} \\ & + \beta_8 \text{Loan covenant} + \beta_9 \text{Revolving tranche} + \beta_{10} \text{Public borrower} + \beta_{11} \text{Total} \\ & \text{assets} + \beta_{12} \text{ROA} + \beta_{13} \text{Leverage} + \text{Year of loan origination FE} + \text{Borrower} \\ & \text{region FE} + \text{Borrower industry FE} + \text{Loan purpose FE}. \end{aligned} \tag{Model 2}$$

The independent variable of interest is *Sustainability-linked loan*. Similar to Model 1, our control loan group includes syndicated loans with complete interest rate data matched with sustainability-linked loans using a propensity score matching methodology based on size, maturity, year of loan origination, borrower's total assets, region and industry and whether the borrower is a public firm. Importantly, we further match treatment and control group loans on ESG risk to mitigate the concern that our results can be attributed to the lower ESG risk of sustainability-linked loan borrowers reported in Table 3 (e.g., Goss and Roberts 2011; Chava 2014). Indeed, our propensity matching methodology achieves balanced condition in our sample (Panel A of Table 4). All other model specifications are similar to the ones in Model 1. In Panel B of Table 4, in three

out of four specifications, we document that the use of sustainability-linked pricing is negatively related to loan margin. Specifically, sustainability-linked loans have on average 20% lower interest rates compared to similar loans issued by other borrowers.¹⁹

In untabulated tests, controlling for borrower fixed effects, we find that the pricing of SLL does not significantly differ to the interest rate charged in other syndicated loans originated by the same borrowers. Thus, SLL borrowers do not receive a significant pricing incentive (“greenium”) upfront to include ESG pricing contractual features in their loan agreements. Thus, the lower interest rate of sustainability-linked loans reported in specifications 2-4 of Panel B is likely attributed to the greater reputation of SLL borrowers rather than investors’ pricing greenium of these loans.

In Table C1 of Appendix C, we replicate our analyses on the pricing of sustainability-linked loans and the relation between ESG risk and sustainability-linked lending using as a control group a sample of syndicated green loans issued over the period 2017-2021 reported in DealScan. Details for obtaining our green loan sample are also discussed in Section 2.2. We document that the selection of SLL borrowers and the SLL pricing is overly similar to that in the green lending segment, further reinforcing our argument that borrowers presumably employ ESG pricing terms as an alternative credit practice to signal their quality.

5.3. KPI characteristics and borrowers’ ESG risk

In the second set of analyses, we examine the link between important KPI features (verification and materiality) and borrower’s ESG risk within our sample of sustainability-linked loans. We use a probabilistic model where the dependent variable is our proxies for KPI

¹⁹ In untabulated robustness tests, we find that our results on the determinants and pricing of SLLs remain robust to measuring ESG risk using Refinitiv’s ESG rating scores.

characteristics discussed in Section 4.2.

$$\begin{aligned}
 Prob(KPI\ characteristic=1) = & \alpha + \beta_1 ESG\ risk + \beta_2 Public\ borrower + \beta_3 Loan\ size \\
 & + \beta_4 Loan\ maturity + \beta_5 Loan\ amendment + \beta_6 Loan\ collateral \\
 & + \beta_7 Loan\ covenant + \beta_8 Revolving\ tranche + \beta_9 Number\ of\ KPIs \\
 & + \beta_{10} Top\ SLL\ lender + \beta_{11} Total\ assets + \beta_{12} ROA + \beta_{13} Leverage \\
 & + Year\ of\ loan\ origination\ FE + Borrower\ region\ FE \\
 & + Borrower\ industry\ FE + Loan\ purpose\ FE.
 \end{aligned}$$

(Model 3)

The independent variable of interest is *ESG risk* (or *ESG risk, industry adjusted*). In addition to the control variables employed in Model 1, we further include across our specifications a proxy for the Number of KPIs included in a sustainability-linked loan (*Number of KPIs*) and an indicator variable of whether loan is arranged by a reputable lead bank in this credit market segment (*Top SLL lender*). All other specifications are similar to the ones in Model 1.

5.3.1. KPI verification and borrowers' ESG risk

We first investigate whether borrowers' ESG risk is related to KPI verification, measured by *KPI Granularity* and *Top Sustainability verifier*. We report the results of these tests in Table 5. In specifications (1)-(4), we show that our measures of ESG risk are inversely related to KPI granularity, thus, loans to borrowers with higher ESG risk are more likely to include aggregate sustainability KPIs, such as ESG score or use of proceeds, rather than granular ones (e.g., greenhouse gas emissions, workplace safety measures). To exemplify, an increase in *ESG risk* (*ESG risk, industry adjusted*) by one standard deviation decreases the probability of a loan including a granular KPI by about 8.7% (8.3%), which represents about 18.5% (17.8%) of the variable's sample mean. In untabulated tests, we further find that loans to borrowers with high ESG risk are more likely to employ aggregate sustainability performance indicators (i.e., ESG score or use-of-proceeds targets).

Overall, these findings lend support to the argument that borrower's ESG risk is negatively

associated to the use of granular and specific KPIs in sustainability-linked loans, presumably because low-ESG-quality borrowers do not have efficient internal reporting systems to collect data about and measure ESG specific metrics. This finding is further supported by our interviews with several SLL lead banks, suggesting that SLLs require the development of measurement systems for the sustainability indicators. Thus, the use of aggregate ESG proxies can alleviate lead lenders' monitoring and screening costs for these borrowers.

Moreover, we examine whether lenders are more likely to demand the verification of sustainability KPIs for high-ESG-risk borrowers. In specifications (5)-(8), we document that lenders likely rely on reputable sustainability coordinators or auditors/rating agencies when offering a sustainability-linked loan to a borrower with high ESG risk. Specifically, an increase in *ESG risk (ESG risk, industry adjusted)* by one standard deviation increases the probability of a *Top Sustainability verifier* by 8.8% (7.6%), which represents about 21.0% (18.1%) of the variable's sample mean. Collectively, these findings are consistent with the view that lead lenders employ contractual mechanisms to lower information costs with respect to screening and monitoring borrowers' ESG risk by relying on the reputation and expertise of rating agencies, auditors and sustainability coordinators.²⁰

5.3.2. *KPI materiality and borrowers' ESG risk*

Next, we explore whether the use of material KPI is more prevalent in loans to high ESG risk borrowers, since such KPIs are expected to better signal underlying ESG risks. We conduct a battery of tests to investigate the association between borrower's ESG risk and KPI materiality. First, we examine whether sustainability-linked loans are more likely to include an environmental or social KPI (*KPI Environmental indicator* and *KPI Social indicator*) when borrowers exhibit

²⁰ In untabulated robustness tests, we find that our results on the relation between KPI verification and borrower's ESG risk remain robust to measuring ESG performance using Refinitiv's ESG rating scores.

high environmental and social risks, measured by ten minus MSCI's environmental and social pillar scores, respectively. KPI classifications are discussed in Panel B of Table 1. We report the results of these tests in Panel A of Table 6. We find no association between borrowers' environmental or social risk and the use of a relevant KPI in sustainability-linked loans.

Second, we measure KPI materiality based on SASB's materiality classification by industry and report the results in Panel B. Across our specifications, we find no evidence of a significant association between ESG risk and KPI materiality, suggesting that lenders do not employ more material KPI in loans to borrowers of higher ESG risks. We note that the mean *KPI Materiality* is 47.6%, thus, about half of sustainability-linked loans do not include a material KPI. Based on the tests reported in Panel B, we further conclude that the inclusion of material KPI in loan agreements is not linked to borrower's underlying ESG risks.

Third, to mitigate the concern that our results on KPI materiality are driven by our variable choice of ESG risk, we examine whether sustainability-linked loans to borrowers with high greenhouse gas emissions are more likely to include a greenhouse gas emission or energy management KPI (*KPI GHG emissions /Energy mngmt*).²¹ We document no significant relation between borrower's greenhouse gas emissions and the use of environmental KPIs (Panel C), consistent with the interpretation that lenders do not usually contract on material KPIs in loan agreements to high polluters. Relatedly, in Table C2, Panel A and B of Appendix C, we continue to find no association between KPI materiality and ESG risk using Refinitiv's ESG score rating, suggesting that the results cannot be attributed to our choice of ESG rating provider.

In untabulated analyses, we examine whether the relation between a borrower's ESG risk and KPI materiality is stronger for SLLs underwritten by a reputable lead bank (measured by the *Top*

²¹ Our results are similar to whether we focus on the probability of using a greenhouse gas emission KPI (untabulated).

SLL Lender) and those including an expert verification provider (measured by *Top Sustainability verifier*). We augment Model 3, where the dependent variable is our KPI materiality measures, with the interaction term between *ESG risk* (or *ESG risk, industry adjusted*) and our proxies for lead bank's or verifier's reputation. All other model specifications remain the same. We fail to find evidence consistent with those arguments. Moreover, we investigate whether KPI materiality enhances for SLLs to high ESG risk borrowers following the SLLP issuance on March 20, 2019. We augment Model 3 using our KPI materiality proxies as dependent variables with the interaction term between *ESG risk* (or *ESG risk, industry adjusted*) and an indicator variable of whether an SLL is originated after the SLLP issuance date. We again fail to find statistically significant results, potentially indicating that the voluntarily guidelines have not been widely adopted and thus ESG criteria remain at its infancy.

Overall, our findings lend support to the argument that the underwriting standards of sustainability-linked loans fail to focus on material ESG features, i.e., sustainability performance indicators that efficiently map borrower's relevant ESG risks. This evidence is in line with our discussions with credit market analysts, suggesting that ESG reputable borrowers commonly enter this credit market segment to obtain a sustainability label on their loan agreements. Thus, the “non-materiality” of KPIs included in these loans reflects borrower-friendly credit terms and underwriting standards that fail to capture relevant ESG risks.

5.4. Sustainability-linked pricing incentives and borrowers' ESG risk

In our third set of analyses, we explore the pricing incentives included in sustainability-linked loans, measured by *DecRate SPP*, *SPP Margin Adj.* and *SPP Margin Adj. Range*. We expect the sustainability performance-pricing discount or penalty to be higher for low-ESG-performance borrowers as an incentive to enhance their ESG risk. We report the results of these analyses in

Table 7. Across our specifications, we document no significant association between ESG risk and the use of sustainability performance pricing penalties (Panel A) and the pricing adjustments in sustainability-pricing grid (Panel B). In untabulated tests, we show that these results are robust to deflating sustainability-pricing adjustments by loan margin. We replicate these analyses using Refinitiv's ESG rating score (Table C2, Panel C of Appendix C). Although we continue to find that sustainability pricing adjustments are not linked to borrowers' ESG riskiness, we show that SLLs to high ESG risk borrowers are less likely to include a pricing penalty. Combined with the findings in Panel A of Table 7, we document no evidence of the use of pricing penalties in SLLs to high ESG risk borrowers.

Consistent with our discussions with managers at a large investment bank, these findings are further explained by lenders and borrowers frequently drafting pricing adjustments based on a common template that consists of contractual pricing features of recent SLLs issued to competitive firms. Thus, considering the fact that this contract innovation was only recently introduced in the credit market, loan investors are typically more comfortable accepting sustainability pricing adjustments employed in prior loan deals. Indeed, when we estimate the distance between an SLL's sustainability pricing adjustment and the mean pricing adjustment in loans issued over the prior year to borrowers in the same country and industry, we find that the median distance is zero and that the same pricing adjustments are used in about 63% of the SLLs. The similarity in contract terms to alleviate screening costs has been also well documented in prior studies (e.g., Murfin and Pratt 2018; Bozanic et al. 2018; DeFranco et al. 2020; Demiroglu et al. 2022).

Another important implication of SLLs being only a recent credit innovation is that lenders may not be willing to extend significant pricing adjustments against sustainability metrics. Examining 65 sample loans for which complete loan contracts are retrieved from EDGAR, we find

that in about eighty percent of the SLLs sustainability KPIs are supplemental to financial metrics (i.e., borrower's credit rating and/or leverage) in the pricing grid. The mean ratio of financial- to sustainability-linked pricing adjustment range is 9.1 percent (untabulated summary statistic). The ratio's correlation with KPI materiality (ESG risk) is positive (negative) and statistically significant, suggesting that loans with more material KPIs (loans to ESG-risky borrowers) place more (less) weight on sustainability metrics.

Collectively, the results in our primary analyses corroborate that the sustainability-linked credit market segment typically attracts low ESG risk borrowers that are presumably interested in acquiring a sustainability label in their loan agreements. SLL contractual features are mostly borrower-friendly without reflecting underlying material ESG risks or incorporating substantial pricing penalties if borrowers fail their contractually specific sustainability targets. Banks also seem to select contractual mechanisms that mitigate information costs related to monitoring and screening of ESG activities.

5.5. Supplemental analyses

5.5.1. KPI restrictiveness and borrowers' ESG risk

In supplemental analyses, we attempt to provide additional insights on KPI materiality by examining the restrictiveness of the sustainability performance target (SPT) thresholds compared to the relevant indicator's performance. To do so, we collect data on target thresholds from lending agreements filed in EDGAR or press releases pertaining to sample loans where borrowers voluntarily disclosed performance targets. We further retrieve the SPT baseline scores from borrowers' sustainability reports in the year prior to a loan's origination. We note that, as per contractual obligation in the sustainability target definitions, borrowers must disclose the performance indicator scores in their annual sustainability reports, which allows us to accurately

estimate the tightness of the pricing targets.²² Our final sample includes 87 sample loans for which we were able to retrieve threshold and baseline data for at least one sustainability target. Our proxy for SPT tightness (*SPT slack*) is the mean percentage slack across the sustainability KPIs in a loan, calculated as: $(\text{target score} - \text{target performance}_{y-1}) / \text{target performance}_{y-1}$.

We report descriptive statistics for SPT tightness in Panel A and B of Table 8. We show that the mean *SPT slack* is about 7.4%. The least (most) restrictive targets are the ones pertaining to borrowers' ESG score (social performance indicators) (Panel A). European borrowers are required to meet more ambitious target thresholds compared to their U.S. and Asian counterparts (Panel B), which may be indicative of the more advanced and well-developed sustainability strategies of European firms. We further document that target restrictiveness is increasing over time, especially for environmental indicators, potentially reflecting the recent development of more rigorous credit guidelines in this segment (LSTA, 2022) (Panel B). Consistent with the view of borrower-friendly underwriting standards in sustainability-linked financing, target restrictiveness does not significantly vary across borrowers of high or low ESG risk (i.e., borrowers with above- or below-median ESG risk) (Panel C). Our interpretations remain unchanged when using a multivariate test to examine the relation between ESG risk and SPT slack (Panel D). This evidence further suggests that lenders' incentives are centered on borrowers meeting a sustainability target—and thus avoiding costly loan renegotiations—rather than disciplining high ESG risk borrowers. Last, while borrowers must disclose the target baseline scores in their sustainability reports, we were not able to locate the relevant information for 51 SPTs in the loan sample, further reinforcing the argument

²² For instance, the term of greenhouse gas emission baseline in Aptiv's amended loan agreement (dated as of June 24, 2021) is defined as follows: "GHG KPI Baseline means the applicable baseline for GHG Emissions Intensity for calendar year 2019 as set forth in the Sustainability Report issued in calendar year 2020 (...)" (page 23, <https://www.sec.gov/Archives/edgar/data/1521332/000119312521200328/d139692dex11.htm>). Similar disclosure practices related to SPT baseline score are commonly included in SLL contracts.

of lenders' weak screening and monitoring of sustainability-linked borrowers.²³

5.2.2. *Learning*

We next examine whether the lack of a significant relation between ESG risk and contract design features, such as KPI materiality, pricing adjustments and target restrictiveness, could reflect the early stages of this contract innovation. Over time, lenders and borrowers may learn from designing such contracts and adjust these contract features. In untabulated analyses, we employ the number of SLLs that a lead bank has previously issued as a proxy for learning, assuming that knowledge and expertise accumulates within a lender based on the number of deals it underwrites over time. We find that this variable is insignificant in our models and fails to moderate the relation between ESG risk and the above-mentioned contract features. One caveat is that these results can be driven by our short sample period, with lenders requiring a longer experience to familiarize with and enhance ESG lending criteria.

5.5.3. *Environmental covenants and pricing targets*

Recent literature has examined the use of environmental covenants in enhancing lenders' environmental monitoring efforts (e.g., Amiram et al. 2021; Choy et al. 2021; Lee and Zakota 2021). Building on these studies, we investigate whether lenders trade-off control rights with respect to borrowers' environmental risk with cash flow rights linked to environmental performance. We collect environmental covenant data included in 65 sustainability-linked loan contracts. *Environmental covenant* is an indicator variable of whether a sustainability-linked loan includes at least one environmental covenant. We employ a probit model, where the dependent variable is an indicator of whether a loan includes an environmental performance-pricing indicator

²³ Related, we exclude 38 SPT referenced in press releases which are vaguely described. Target threshold data are also redacted from ten SLL contracts, further restricting us from estimating SPT slack for these indicators.

(KPI Environmental indicator).²⁴

We report the results of these tests in Table 9. We document a positive association between the probability of a loan including an environmental covenant and performance-pricing indicator. Specifically, the use of an environmental covenant increases the probability of an environmental-linked pricing grid by 59.1%. This finding is robust to controlling for borrower's financial performance. Thus, environmental performance pricing likely supplements the monitoring role of environmental covenants by directly providing lenders with risk compensation as borrower's ESG risk deteriorates.

6. Conclusion

Sustainability-linked financing (i.e., syndicated loans for which pricing is linked to a sustainability performance indicator) has rapidly evolved into a significant debt product within the private credit market. Over the past few years, the increasing demand by lenders and investors for ESG-linked debt has fueled the growth of this credit market segment by about 271% annually. This sustainability lending hype has raised skepticism among many industry commentators for whether this contractual innovation indeed incorporates sufficient, relevant and material sustainability KPIs that can effectively pressure firms to better measure, monitor and manage their ESG activities. We provide novel insights on this topic by examining the SLL borrower types and contract design.

Using a sample of sustainability-linked loans and a control group of matched syndicated loans, we show that sustainability-linked financing is more prevalent among low ESG risk borrowers (i.e., borrowers with higher ESG rating scores), suggesting that borrowers likely use this contractual innovation to signal their quality to loan investors. With respect to the sustainability

²⁴ We use an OLS model in specification 2 due to the non-convergence in the non-linear estimation.

KPI characteristics, we document that loans to high ESG risk borrowers are less likely to include granular (e.g., greenhouse gas emissions) rather than aggregate (e.g., ESG rating) performance indicators. We further find that sustainability-linked loans to high ESG risk borrowers are more likely to include a reputable sustainability coordinator in the syndicate structure or incorporate a KPI verification requirement by a reputable ESG rating agency or auditor. Moreover, about half of the sample loans include immaterial sustainability performance indicators, and targets are not overly restrictive. Relatedly, we further find no evidence that ESG riskiness is related to sustainability KPI materiality and restrictiveness. Collectively, this evidence is consistent with the view that sustainability KPIs fail to capture material and relevant ESG objectives. Our findings also lend support to the argument that lenders select contractual mechanisms to mitigate information costs with respect to measuring and monitoring ESG activities.

Our study has certain limitations that offer opportunities for future research. First, sustainability-linked pricing is a nascent practice and therefore we might be observing only the early stages of the market development in our data. In several years, SLLs may have diffused to a larger number of high ESG risk borrowers or the contract design sophistication may well increase over time. Moreover, consistent with the relatively recent adoption of SLLs, the short sample period restricts us from examining whether borrowers substantially improve their sustainability performance over the loan's maturity. In addition, sustainability-linked pricing has been also applied in bond issuance, although with much lower frequency as use of proceeds instruments, such as green bonds, are far more common in the bond market. Since the bond market typically consists of more reputable and transparent borrowers, our findings on the weak contractual sophistication of SLLs may not generalize to sustainability-linked bonds. Finally, recent regulatory initiatives, such as the SEC's efforts to label ESG products or to regulate climate disclosures, may

pressure both banks and companies to better measure and manage their ESG activities, thereby improving SLL contract design. These regulatory interventions may also increase scrutiny over the practices of sustainability verifiers and other information intermediaries participating in the evaluation of SLL contracts increasing the scrutiny that these institutions apply when evaluating contractual terms. We leave these questions for future research to explore.

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Appendix A. Examples of sustainability performance-linked pricing provision.

Example 1. The following excerpt is from the amended loan agreement filed on June 14, 2021 between Sun Communities Operating Limited Partnership and its lenders.²⁵

Section 1.01. Defined Terms (page 17).

Notwithstanding the foregoing, if at the end of any fiscal year (commencing with the fiscal year ending December 31, 2021) the Borrower's Sustainability Rating for such fiscal year is more favorable than its Sustainability Rating for the immediately preceding fiscal year (the "Sustainability Metric"), in each case as certified by the Borrower to the Administrative Agent with supporting information as reasonably required by the Administrative Agent, the Applicable Rate shall decrease by one basis point (but not to below zero percent (0%) per annum) from the Applicable Rate that would otherwise be applicable; provided that on each annual anniversary of such change to the Applicable Rate, the Applicable Rate shall revert to the original grid set forth above unless and until the Sustainability Metric for the preceding year has been satisfied.

"Sustainability Rating" means the environmental social and governance (ESG) rating obtained by the Borrower from Dow Jones, S&P, GRESB or any similar index reasonably approved by the Administrative Agent.

Example 2. The following excerpt is from the amended loan agreement filed on April 28, 2021 between Jabil Inc. and its lenders.²⁶

Section 1.01. Defined Terms (page 61).

"Sustainability Margin Adjustment" with respect to any Pricing Certificate for any fiscal year, an amount (whether positive, negative or zero), expressed as a percentage, calculated as the sum of the adjustments for each KPI Metric, determined as follows:

- (a) an increase of 0.0133% (0.0134% for GHG Emissions Intensity) if the applicable KPI Metric for such fiscal year is worse than the applicable Penalty Threshold set forth for the applicable KPI Metric in the Sustainability Table for such fiscal year;
- (b) 0.0000% if the applicable KPI Metric for such fiscal year does not surpass the applicable Discount Threshold set forth for the applicable KPI Metric in the Sustainability Table and is not worse than the applicable Penalty Threshold set forth for the applicable KPI Metric in the Sustainability Table for such fiscal year; and
- (c) a decrease of 0.0133% (0.0134% for GHG Emissions Intensity) if the applicable KPI Metric for such fiscal year surpasses the applicable Discount Threshold set forth for the applicable KPI Metric in the Sustainability Table for such fiscal year.

²⁵ <https://sec.report/Document/0000912593-21-000151/fourthamendedandrestredcr.htm>

²⁶ <https://www.sec.gov/Archives/edgar/data/898293/000119312521150094/d173875dex101.htm>

Appendix B. Variable Definitions

Variables	Variable definitions
Loan sustainability features	
<i>DecRate SPP</i>	Binary variable equal to one if an SLL includes a decreasing one-way sustainability performance pricing provision, zero otherwise.
<i>KPI Environmental</i>	The number of sustainability performance targets based on an environmental performance metric.
<i>KPI Environmental indicator</i>	Binary variable equal to one if an SLL includes an environmental-performance target, zero otherwise.
<i>KPI Granularity</i>	Binary variable equal to one if an SLL includes only granular sustainability performance targets (environmental, social or governance), zero otherwise.
<i>KPI GHG emissions /Energy mngmt</i>	Binary variable equal one if an SLL included a greenhouse gas emission or energy management target, zero otherwise.
<i>KPI Materiality</i>	Binary variable equal to one if an SLL includes an environmental, social or governance target classified as material under the SASB Materiality Map.
<i>KPI Materiality (pct.)</i>	The ratio of the number of environmental, social or governance targets classified as material under the SASB Materiality Map, deflated by the total number of targets in the SLL.
<i>KPI Social</i>	The number of sustainability performance targets based on a social performance metric.
<i>KPI Social indicator</i>	Binary variable equal to one if an SLL includes a social-performance target, zero otherwise.
<i>Number of KPIs</i>	The number of sustainability performance targets in an SLL.
<i>One-Way SPP</i>	Binary variable equal to one if an SLL includes an increasing or decreasing one-way sustainability performance pricing provision, zero otherwise.
<i>SPP Margin adj.</i>	The absolute value of all-in-drawn LIBOR-spread adjustment (in basis points, excluding fees) based on sustainability performance target thresholds.
<i>SPP Margin adj. range</i>	The all-in-drawn LIBOR-spread adjustment range (in basis points, excluding fees) based on sustainability performance target thresholds.
<i>Sustainability-linked loan</i>	Binary variable equal to one if a loan includes a sustainability performance pricing provision, zero otherwise.
<i>Top SLL lender</i>	Binary variable equal to one if an SLL's underwriter is a top-five ESG lender (measured by SLL issuance volume), zero otherwise. Top-five ESG lenders include Bank of America, BBVA, BNP Paribas, JP Morgan and ING.
<i>Top Sustainability verifier</i>	Binary variable equal to one if: (i) an SLL's syndicate includes a top-five sustainability arranger (measured by SLL issuance volume), or (ii) KPIs are verified by a reputable external consultant or rating agency, zero otherwise. Top-five sustainability arrangers include BBVA, BNP Paribas, Credit Agricole, ING and Rabobank. Reputable consultants and rating agencies include Vigeo Eiris, Sustainalytics, GRESB, ISS, S&P, MSCI, RobecoSam, Dow Jones, FTSE Russell and Big 4 accounting firms (PwC, EY, KPMG, Deloitte).

Appendix B (Continued)

Loan terms

<i>Loan amendment</i>	Binary variable equal to one if a loan is an amendment, zero otherwise.
<i>Loan collateral</i>	Binary variable equal to one if a loan is collateralized, zero otherwise.
<i>Loan covenant</i>	Binary variable equal to one if a loan includes a financial covenant, zero otherwise.
<i>Loan margin</i>	The natural logarithm of all-in-drawn LIBOR-spread (in basis points, excluding fees).
<i>Loan maturity</i>	The natural logarithm of loan maturity (in years).
<i>Loan size</i>	The natural logarithm of loan amount (in USD).
<i>Revolving tranche</i>	Binary variable if a loan includes a revolving tranche, zero otherwise.

Borrower ESG metrics

<i>Environmental risk</i>	Ten minus the environmental pillar score provided by MSCI.
<i>ESG risk</i>	Ten minus the weighted average ESG pillar score provided by MSCI.
<i>ESG risk, industry adjusted</i>	Ten minus the industry-adjusted weighted average ESG pillar score provided by MSCI.
<i>Scope 1 and 2 emissions</i>	The ratio of a borrower's GHG Scope 1 and 2 emissions, deflated by operating income. If data are unavailable at the borrower level, we use the ratio measured at the borrower's corporate parent level.
<i>Scope 1, 2 and 3 emissions</i>	The ratio of a borrower's GHG Scope 1, 2 and 3 emissions, deflated by operating income. If data are unavailable at the borrower level, we use the ratio measured at the borrower's corporate parent level.
<i>Social risk</i>	Ten minus the social pillar score provided by MSCI.

Borrower financial metrics

<i>Leverage</i>	Total liabilities to total assets.
<i>Public borrower</i>	Binary variable if a borrower is a publicly listed company, zero otherwise.
<i>ROA</i>	Earnings before interest and tax to total assets.
<i>Total assets</i>	The natural logarithm of total assets.

Appendix C. Additional analyses

Table C1. Sustainability-linked loans, green loans and borrower's ESG risk.

This table reports the results of the tests on the relation between the probability of a loan including a sustainability-performance pricing provision and i) borrower's ESG risk, and ii) loan interest rate, using a sample of green syndicated loans as control group. Variables are defined in Appendix B. The values of the continuous variables are winsorized at 1% and 99%. Control variables (untabulated) are the same to the ones used in primary analyses. Year of loan origination, borrower's region of incorporation, borrower's GICS industry and loan purpose fixed effects are included but not tabulated. In specifications (1)-(4), we use a probit model, and marginal effects are reported. In specifications (5)-(8), we use an OLS regression to estimate our model. Standard errors are reported in parentheses, corrected for heteroskedasticity and clustered at the borrower level. ***, ** and * denote significance at the 1%, 5% and 10% (two-way) levels, respectively. Coefficients of interest are in boldface type.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	<i>Sustainability-linked loan</i>				<i>Loan margin</i>			
<i>Sustainability-linked loan</i>					0.007	-0.310	-0.013	-0.385
					(0.234)	(0.432)	(0.240)	(0.448)
<i>ESG risk</i>	-0.001	-0.001			0.205***	0.146***		
	(0.004)	(0.001)			(0.055)	(0.048)		
<i>ESG risk, industry adjusted</i>			-0.001	-0.000			0.085***	0.059**
			(0.002)	(0.000)			(0.026)	(0.023)
<i>Loan and Borrower characteristics controls</i>	YES	YES	YES	YES	YES	YES	YES	YES
<i>Borrower financials controls</i>	NO	YES	NO	YES	NO	YES	NO	YES
Observations	465	417	465	417	180	160	180	160
R-squared	0.425	0.451	0.426	0.452	0.356	0.389	0.350	0.384
Fixed effects	YES	YES	YES	YES	YES	YES	YES	YES

Table C2. Using an alternative measure of ESG risk.

This table reports the results of the tests that corroborate whether the findings of KPI materiality and sustainability pricing adjustment are robust to an alternative measure of ESG risk. *ESG risk (Refinitiv)* is defined as 100 minus the borrower's ESG rating provided by Refinitiv. All model specifications are the same to the ones used in the respective models of our primary analyses. Standard errors are reported in parentheses, corrected for heteroskedasticity and clustered at the borrower level. ***, ** and * denote significance at the 1%, 5% and 10% (two-way) levels, respectively. Coefficients of interest are in boldface type.

Panel A. Borrower's environmental and social risk and the use of a relevant sustainability performance target.

VARIABLES	(1)	(2)	(3)	(4)
	<i>KPI Environmental indicator</i>		<i>KPI Social indicator</i>	
	<i>ESG = Environmental</i>		<i>ESG = Social</i>	
<i>ESG risk (Refinitiv)</i>	-0.002 (0.002)	-0.002 (0.002)	-0.001 (0.001)	-0.001 (0.001)
<i>Loan and Borrower characteristics controls</i>	YES	YES	YES	YES
<i>Borrower financials controls</i>	NO	YES	NO	YES
Observations	378	356	378	356
Pseudo R-squared	0.370	0.367	0.403	0.410
Fixed effects	YES	YES	YES	YES

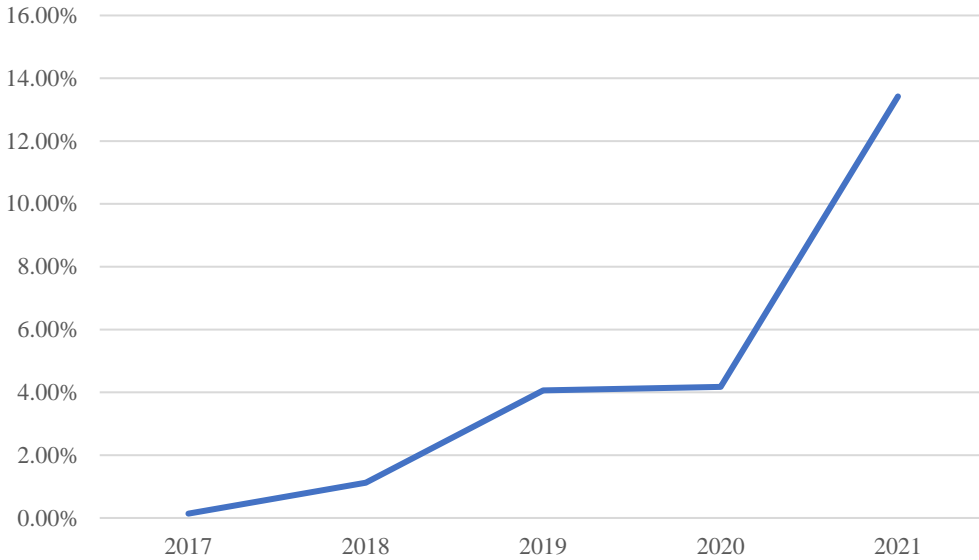
Panel B. Borrower's ESG risk and the use of a material sustainability performance indicator based on SASB Materiality Map.

VARIABLES	(1)	(2)	(3)	(4)
	<i>KPI Materiality</i>		<i>KPI Materiality (pct.)</i>	
<i>ESG risk (Refinitiv)</i>	0.001 (0.002)	0.002 (0.003)	-0.001 (0.001)	0.000 (0.001)
<i>Loan and Borrower characteristics controls</i>	YES	YES	YES	YES
<i>Borrower financials controls</i>	NO	YES	NO	YES
Observations	378	356	378	356
(Pseudo) R-squared	0.424	0.435	0.432	0.457
Fixed effects	YES	YES	YES	YES

Table C2 (continued)**Panel C. Borrower's ESG risk and sustainability performance pricing adjustments.**

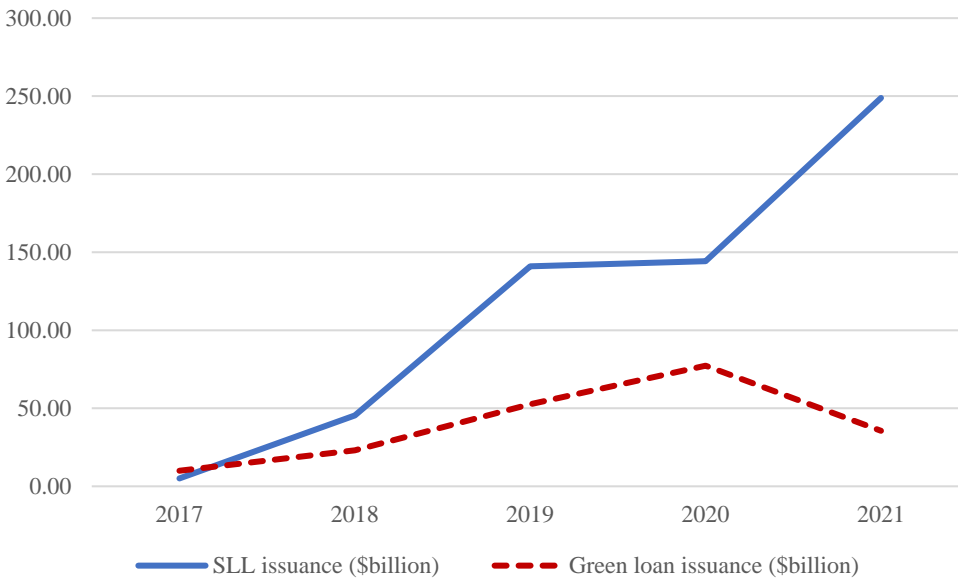
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	<i>DecRate SPP</i>	<i>SPP Margin Adj.</i>	<i>SPP Margin Adj.</i>	<i>SPP Margin Adj.</i>	<i>SPP Margin Adj. Range</i>	<i>SPP Margin Adj. Range</i>
<i>ESG risk (Refinitiv)</i>	0.003** (0.001)	0.003** (0.002)	0.012 (0.026)	0.006 (0.028)	0.033 (0.054)	0.017 (0.054)
<i>Loan and Borrower characteristics controls</i>	YES	YES	YES	YES	YES	YES
<i>Borrower financials controls</i>	NO	YES	NO	YES	NO	YES
Observations	378	356	96	93	96	93
(Pseudo) R-squared	0.317	0.320	0.570	0.618	0.606	0.645
Fixed effects	YES	YES	YES	YES	YES	YES

Figure 1. Sustainability-linked loan issuance over time.



This figure plots the total annual sustainability-linked loan issuance volume in our sample as a percentage of total loan issuance (in \$million) over time, using syndicated loan data in DealScan.

Figure 1. Sustainability-linked and green loan issuance over time.



This figure plots the total annual sustainability-linked loan issuance volume (in \$ billion) in our sample (solid line) and the total annual green loan issuance (in \$ billion) (dotted line) over time, using green loan data in DealScan.

Table 1. Descriptive statistics.

This table reports our sample selection process (Panel A); the number of sustainability performance targets by category (Panel B); and the number of sustainability-linked loans and performance targets by GICS industry (Panel C), region (Panel D) and year of loan issuance (Panel E).

Panel A. Sample selection.

	Obs.
Primary Sustainability-linked loan (SLL) sample	671
<u>By data source:</u>	
LoanConnector	554
Bloomberg	117
Minus:	
Loans erroneously classified as SLL	98
<u>By data source:</u>	
LoanConnector	27
Bloomberg and Press Releases	71
Final SLL sample	573
<u>By data source:</u>	
LoanConnector	527
Bloomberg and Press Releases	46

Panel B. Sustainability performance targets by category.

KPI type	KPI classification	Number of KPIss
Circularity & Waste management	Environmental	51
Customer & Product quality	Social	50
Diversity & Inclusion	Social	71
ESG certification	ESG score	46
ESG score	ESG score	176
Ecological impacts	Environmental	14
Employee Health & Safety	Social	52
Energy Management	Environmental	133
GHG emissions	Environmental	270
Governance	Governance	12
Human Rights & Community Relations	Social	35
Materials Sourcing & Supply Chain (Environmental)	Environmental	31
Materials Sourcing & Supply Chain (Social)	Social	7
Other	Other	34
Sustainability index listing	ESG score	16
Use of proceeds	Use of proceeds	31
Water management	Environmental	38

Panel C. Sustainability-linked loans and the mean number of performance targets by GICS industry.

Industry	SLL	Mean Number of KPIss	Mean number of Environmental KPIs	Mean number of Social KPIs	Mean number of ESG score-KPIs
Communication Services	21	1.857	0.714	0.714	0.238
Consumer Discretionary	43	1.744	0.721	0.558	0.349
Consumer Staples	60	2.550	1.617	0.450	0.433
Energy	30	1.567	1.100	0.200	0.200
Financials	49	2.122	0.714	0.449	0.490
Health Care	16	2.563	1.313	0.938	0.188
Industrials	99	1.566	0.646	0.374	0.394
Information Technology	20	2.250	1.150	0.350	0.350
Materials	55	2.073	1.164	0.382	0.345
Real Estate	95	1.663	0.716	0.137	0.705
Utilities	85	1.835	1.024	0.329	0.318

Panel D. Sustainability-linked loans and the mean number of performance targets by region.

Region	SLL	Mean Number of KPIss	Mean number of Environmental KPIs	Mean number of Social KPIs	Mean number of ESG score-KPIs
Asia	82	1.854	0.951	0.171	0.610
Europe	377	1.862	0.883	0.438	0.361
Latin America	10	3.000	1.900	0.400	0.200
North America	85	1.871	1.000	0.247	0.471
Oceania	15	2.400	1.267	0.467	0.667
Other	4	2.000	1.000	1.000	0.000

Panel E. Sustainability-linked loans and the mean number of performance targets by year of loan issuance.

Year of loan issuance	SLL	Mean Number of KPIss	Mean number of Environmental KPIs	Mean number of Social KPIs	Mean number of ESG score-KPIs
2017	9	1.222	0.333	0.000	0.889
2018	41	1.976	0.927	0.195	0.634
2019	141	1.723	0.794	0.362	0.496
2020	179	1.911	1.006	0.358	0.346
2021	203	2.020	1.010	0.453	0.355

Table 2. Summary statistics and Correlation matrix.

This table reports the summary statistics of the variables used in our analysis (Panel A) and the Spearman correlation matrix of selected variables (Panel B). The values of continuous variables are winsorized at 1% and 99%. Variables are defined in Appendix B. ***, ** and * denote significance at the 1%, 5% and 10%, respectively.

Panel A. Summary statistics.

Variable	Obs.	Mean	S.D.	Q1	Median	Q3
Sustainability-linked loan features						
<i>DecRate SPP</i>	573	0.246	0.431	0.000	0.000	0.000
<i>KPI Environmental</i>	573	0.939	1.042	0.000	1.000	1.000
<i>KPI Environmental indicator</i>	573	0.574	0.495	0.000	1.000	1.000
<i>KPI Granularity</i>	573	0.468	0.499	0.000	0.000	1.000
<i>KPI GHG emissions /Energy mngmt</i>	573	0.532	0.499	0.000	1.000	1.000
<i>KPI Materiality</i>	573	0.476	0.500	0.000	0.000	1.000
<i>KPI Materiality (pct.)</i>	573	0.345	0.409	0.000	0.000	0.667
<i>KPI Social</i>	573	0.375	0.703	0.000	0.000	1.000
<i>KPI Social indicator</i>	573	0.274	0.446	0.000	0.000	1.000
<i>Number of KPIs</i>	573	1.897	1.237	1.000	2.000	3.000
<i>One-Way SPP</i>	573	0.251	0.434	0.000	0.000	1.000
<i>SPP Margin adj.</i>	128	4.766	3.986	2.250	5.000	5.000
<i>SPP Margin adj. range</i>	128	8.637	8.178	4.000	6.750	10.000
<i>Top SLL lender</i>	573	0.302	0.459	0.000	0.000	1.000
<i>Top Sustainability verifier</i>	573	0.421	0.494	0.000	0.000	1.000
Loan terms						
<i>Loan amendment</i>	573	0.250	0.433	0.000	0.000	0.000
<i>Loan collateral</i>	573	0.169	0.375	0.000	0.000	0.000
<i>Loan covenant</i>	573	0.141	0.349	0.000	0.000	0.000
<i>Loan margin</i>	221	4.873	0.683	4.382	4.828	5.416
<i>Loan margin (basis points)</i>	221	161.929	105.053	80.000	125.000	225.000
<i>Loan maturity</i>	573	1.489	0.405	1.322	1.624	1.641
<i>Loan size</i>	573	19.965	1.340	19.008	20.052	20.946
<i>Revolving tranche</i>	573	0.618	0.486	0.000	1.000	1.000
Borrower ESG metrics						
<i>Environmental risk</i>	388	4.064	1.949	2.900	4.000	5.500
<i>ESG risk</i>	388	4.510	1.030	3.800	4.600	5.250
<i>ESG risk, industry adjusted</i>	388	3.746	2.309	2.050	3.400	5.200
<i>Scope 1 and 2 emissions</i>	106	0.039	0.069	0.003	0.013	0.046
<i>Scope 1, 2 and 3 emissions</i>	106	0.126	0.125	0.029	0.093	0.17
<i>Social risk</i>	388	5.127	1.829	4.050	5.000	6.500

Table 2 (continued)

Borrower financial metrics

<i>Leverage</i>	517	0.606	0.152	0.519	0.606	0.694
<i>Public borrower</i>	573	0.696	0.460	0.000	1.000	1.000
<i>ROA</i>	517	0.044	0.045	0.027	0.044	0.056
<i>Total assets</i>	517	22.383	2.319	21.402	22.802	23.767

Table 2 (continued)

Panel B. Spearman correlation matrix of selected variables.

Obs.= 388	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) <i>ESG risk</i>	1.000								
(2) <i>ESG risk, industry adjusted</i>	0.878***	1.000							
(3) <i>DecRate SPP</i>	0.0964*	0.186***	1.000						
(4) <i>KPI Granularity</i>	-0.063	-0.111**	-0.134***	1.000					
(5) <i>KPI Materiality</i>	0.018	-0.018	-0.084*	0.570***	1.000				
(6) <i>KPI Materiality (pct.)</i>	-0.008	-0.024	-0.112**	0.644***	0.945***	1.000			
(7) <i>Loan amendment</i>	0.054	0.035	-0.038	-0.033	0.060	0.053	1.000		
(8) <i>Loan collateral</i>	0.086*	0.095*	-0.078	0.048	0.102**	0.130**	0.153***	1.000	
(9) <i>Loan covenant</i>	0.131***	0.152***	0.179***	0.029	0.008	0.003	0.338***	0.350***	1.000
(10) <i>Loan maturity</i>	0.012	0.006	-0.061	-0.051	0.045	0.064	-0.003	0.033	-0.104**
(11) <i>Loan size</i>	-0.123**	-0.150***	-0.132***	0.123**	0.076	0.079	0.240***	0.098*	0.229***
(12) <i>Number of KPIs</i>	0.036	-0.032	-0.026	0.249***	0.495***	0.376***	0.033	0.001	-0.009
(13) <i>Public borrower</i>	-0.073	-0.068	0.005	0.052	0.058	0.046	0.094*	0.019	0.147***
(14) <i>Revolving tranche</i>	-0.107**	-0.139***	-0.085*	0.054	0.065	0.060	0.223***	-0.062	0.241***
(15) <i>Top SLL lender</i>	-0.017	0.001	0.005	-0.005	-0.061	-0.087*	0.032	0.139***	0.200***
(16) <i>Top Sustainability verifier</i>	0.020	0.001	-0.065	-0.218***	-0.157***	-0.161***	0.004	-0.074	-0.081

Obs.= 388	(10)	(11)	(12)	(13)	(14)	(15)
(10) <i>Loan maturity</i>	1.000					
(11) <i>Loan size</i>	0.052	1.000				
(12) <i>Number of KPIs</i>	-0.063	0.050	1.000			
(13) <i>Public borrower</i>	-0.087*	0.000	0.057	1.000		
(14) <i>Revolving tranche</i>	-0.026	0.261***	0.075	0.148***	1.000	
(15) <i>Top SLL lender</i>	-0.078	0.085*	-0.017	-0.009	0.075	1.000
(16) <i>Top Sustainability verifier</i>	0.131***	0.101**	-0.033	-0.086*	0.063	0.160***

Table 3. Determinants of sustainability-linked lending.

This table reports the results of the tests on the relation between the probability of a loan including a sustainability-performance pricing provision and borrower’s ESG risk. We match sustainability-linked loans (SLL) with syndicated loans issued to non-SLL borrowers over the sample period based on loan size, loan maturity, borrower’s public ownership status and total assets. The one-to-one propensity score matching of treated loans is done in random order and without replacement. Matched loans are within a distance (“caliper”) of 0.01 of the propensity score of the loans in the treatment group. Panel A shows the covariate balance between the unmatched and the matched samples. Panel B presents the estimation results of analyses that examine the probability of a loan including a sustainability performance target using the matched sample. *Sustainability-linked loan* is a binary variable equal to one if a loan includes a sustainability-performance pricing provision, zero otherwise. The independent variable of interest is *ESG risk (ESG risk, industry adjusted)*, defined as ten minus a borrower's (industry-adjusted) weighted-average ESG pillar score provided by MSCI. Variables are defined in Appendix B. The values of the continuous variables are winsorized at 1% and 99%. Year of loan origination, borrower’s region of incorporation, borrower’s GICS industry and loan purpose fixed effects are included but not tabulated. We use a probit model across all specifications, marginal effects are reported and standard errors are in parentheses. Standard errors are corrected for heteroskedasticity and clustered at the borrower level. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively. Coefficients of interest are in boldface type.

Panel A. Covariate balance.

Sample:	Unmatched			Matched		
	1	0	t-test	1	0	t-test
<i>Sustainability-linked loan</i>						
<u>Specifications (1) and (3), Panel B</u>						
<i>Public borrower</i>	0.858	0.742	5.17***	0.847	0.861	-0.53
<i>Loan size</i>	20.244	19.947	4.33***	20.172	20.159	0.13
<i>Loan maturity</i>	1.492	1.255	6.66***	1.475	1.515	-0.92
<u>Specifications (2) and (4), Panel B</u>						
<i>Public borrower</i>	0.856	0.867	-0.60	0.852	0.829	0.82
<i>Loan size</i>	20.234	20.011	3.19***	20.185	20.165	0.21
<i>Loan maturity</i>	1.501	1.234	7.29***	1.491	1.535	-1.07
<i>Total assets</i>	23.036	22.797	2.73***	22.980	22.998	-0.15

Panel B. Sustainability-linked loans and ESG risk.

VARIABLES	(1)	(2)	(3)	(4)
	<i>Sustainability-linked loan</i>			
<i>ESG risk</i>	-0.103*** (0.025)	-0.128*** (0.026)		
<i>ESG risk, industry adjusted</i>			-0.036*** (0.011)	-0.045*** (0.012)
<i>Public borrower</i>	-0.113* (0.067)	-0.099 (0.075)	-0.115* (0.066)	-0.100 (0.074)
<i>Loan size</i>	-0.038** (0.019)	-0.025 (0.022)	-0.038** (0.019)	-0.030 (0.022)

Table 3 (continued)

<i>Loan maturity</i>	-0.030 (0.037)	-0.025 (0.044)	-0.027 (0.036)	-0.025 (0.044)
<i>Loan amendment</i>	0.595*** (0.072)	0.680*** (0.077)	0.582*** (0.072)	0.684*** (0.078)
<i>Loan collateral</i>	-0.225*** (0.061)	-0.165** (0.066)	-0.234*** (0.061)	-0.181*** (0.066)
<i>Loan covenant</i>	0.130* (0.076)	0.234*** (0.087)	0.135* (0.076)	0.228*** (0.086)
<i>Revolving tranche</i>	0.093* (0.048)	0.098** (0.049)	0.089* (0.048)	0.096* (0.049)
<i>Total assets</i>		-0.011 (0.017)		-0.010 (0.016)
<i>ROA</i>		0.762* (0.402)		0.758* (0.407)
<i>Leverage</i>		-0.168 (0.142)		-0.193 (0.141)
Observations	719	701	719	701
Pseudo R-squared	0.205	0.225	0.196	0.214
Fixed effects	YES	YES	YES	YES

Table 4. The pricing of sustainability-linked loans.

This table reports the results of the tests on the relation between the probability of a loan including a sustainability-performance pricing provision and loan interest rate. We match sustainability-linked loans (SLL) with syndicated loans issued to non-SLL borrowers over the sample period based on loan size, loan maturity, borrower’s public ownership status, ESG risk and total assets. The one-to-one propensity score matching of treated loans is done in random order and without replacement. Matched loans are within a distance (“caliper”) of 0.01 of the propensity score of the loans in the treatment group. Panel A shows the covariate balance between the unmatched and the matched samples. Panel B presents the estimation results of analyses that examine the relation between loan interest rate and sustainability-linked lending using the matched sample. *Loan margin* is the natural logarithm of all-in-drawn LIBOR-spread (in basis points, excluding fees). The independent variable of interest is *Sustainability-linked loan*, defined as a binary variable equal to one if a loan includes a sustainability-performance pricing provision. Variables are defined in Appendix B. The values of the continuous variables are winsorized at 1% and 99%. Year of loan origination, borrower’s region of incorporation, borrower’s GICS industry and loan purpose fixed effects are included but not tabulated. OLS regressions are used across all specifications, with standard errors reported in parentheses. Standard errors are corrected for heteroskedasticity and clustered at the borrower level. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively. Coefficients of interest are in boldface type.

Panel A. Covariate balance.

Sample:	Unmatched			Matched		
	1	0	t-test	1	0	t-test
<i>Sustainability-linked loan</i>						
<u>Specification (1), Panel B</u>						
<i>Public borrower</i>	0.871	0.685	5.07***	0.856	0.872	-0.370
<i>Loan size</i>	20.721	20.379	3.75***	20.650	20.690	-0.280
<i>Loan maturity</i>	1.534	1.298	4.72***	1.504	1.496	0.130
<i>ESG risk</i>	4.659	5.441	-10.29***	4.713	4.642	0.550
<u>Specification (2), Panel B</u>						
<i>Public borrower</i>	0.865	0.858	0.27	0.863	0.863	0.000
<i>Loan size</i>	20.737	20.413	3.49***	20.669	20.635	0.230
<i>Loan maturity</i>	1.545	1.256	5.59***	1.526	1.481	0.750
<i>ESG risk</i>	4.639	5.413	-9.87***	4.788	4.724	0.480
<i>Total assets</i>	22.936	22.798	1.05	22.894	22.963	-0.310
<u>Specification (3), Panel B</u>						
<i>Public borrower</i>	0.871	0.685	5.07***	0.843	0.850	-0.170
<i>Loan size</i>	20.721	20.379	3.75***	20.658	20.560	0.680
<i>Loan maturity</i>	1.534	1.298	4.72***	1.513	1.519	-0.100
<i>ESG risk, industry adjusted</i>	4.097	5.585	-9.03***	4.249	4.075	0.580
<u>Specification (4), Panel B</u>						
<i>Public borrower</i>	0.865	0.858	0.270	0.865	0.865	0.000
<i>Loan size</i>	20.737	20.413	3.49***	20.663	20.688	-0.170
<i>Loan maturity</i>	1.545	1.256	5.59***	1.509	1.538	-0.450
<i>ESG risk, industry adjusted</i>	4.031	5.543	-8.75***	4.221	4.460	-0.730
<i>Total assets</i>	22.936	22.798	1.050	22.916	23.113	-0.830

Table 4 (continued)

Panel B. The pricing of sustainability-linked loans.

VARIABLES	(1)	(2)	(3)	(4)
	<i>Loan margin</i>			
<i>Sustainability-linked loan</i>	-0.140 (0.091)	-0.212** (0.098)	-0.198** (0.090)	-0.238** (0.109)
<i>ESG risk</i>	0.111*** (0.038)	0.098** (0.043)		
<i>ESG risk, industry adjusted</i>			0.026 (0.017)	0.052** (0.022)
<i>Public borrower</i>	-0.139 (0.103)	-0.040 (0.127)	-0.167 (0.106)	-0.036 (0.155)
<i>Loan size</i>	-0.117*** (0.040)	-0.084* (0.043)	-0.147*** (0.039)	-0.131** (0.051)
<i>Loan maturity</i>	-0.163 (0.101)	-0.113 (0.080)	-0.118 (0.086)	-0.161 (0.106)
<i>Loan amendment</i>	-0.246** (0.108)	-0.212** (0.100)	-0.129 (0.106)	-0.115 (0.124)
<i>Loan collateral</i>	0.469*** (0.075)	0.585*** (0.082)	0.486*** (0.083)	0.414*** (0.097)
<i>Loan covenant</i>	-0.060 (0.097)	-0.027 (0.096)	0.088 (0.098)	0.093 (0.122)
<i>Revolving tranche</i>	-0.130 (0.088)	-0.067 (0.098)	-0.182** (0.091)	-0.093 (0.100)
<i>Total assets</i>		-0.034 (0.033)		-0.034 (0.037)
<i>ROA</i>		-0.419 (0.551)		-1.394** (0.701)
<i>Leverage</i>		-0.267 (0.249)		0.043 (0.274)
Observations	250	234	254	222
(Pseudo) R-squared	0.480	0.519	0.507	0.412
Fixed effects	YES	YES	YES	YES

Table 5. The verification of sustainability performance targets.

This table reports the results of the tests that corroborate whether the verification of sustainability performance indicators is related to borrower's ESG risk. In specifications (1)-(4), the dependent variable is *KPI Aggregate*, defined as indicator variable of whether an SLL includes only granular sustainability performance targets (environmental, social or governance). In specifications (5)-(8), the dependent variable is *Top Sustainability verifier*, defined as an indicator variable of whether an SLL includes (i) a top-five sustainability arranger (measured by SLL issuance volume) in its syndicate structure, or (ii) KPIs are verified by a reputable external consultant or rating agency. The independent variable of interest is *ESG risk (ESG risk, industry adjusted)*, defined as ten minus a borrower's (industry-adjusted) weighted-average ESG pillar score provided by MSCI. Variables are defined in Appendix B. The values of the continuous variables are winsorized at 1% and 99%. Year of loan origination, borrower's region of incorporation, borrower's GICS industry and loan purpose fixed effects are included but not tabulated. We use a probit model to estimate the specifications with marginal effects reported. Standard errors are reported in parentheses, corrected for heteroskedasticity and clustered at the borrower level. ***, ** and * denote significance at the 1%, 5% and 10% (two-sided) levels, respectively. Coefficients of interest are in boldface type.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	<i>KPI Granularity</i>				<i>Top Sustainability verifier</i>			
<i>ESG risk</i>	-0.083*** (0.032)	-0.086** (0.033)			0.089*** (0.032)	0.081** (0.032)		
<i>ESG risk, industry adjusted</i>			-0.036** (0.014)	-0.040*** (0.015)			0.036** (0.014)	0.030** (0.014)
<i>Public borrower</i>	0.003 (0.092)	-0.087 (0.100)	0.007 (0.091)	-0.089 (0.101)	-0.060 (0.088)	-0.103 (0.098)	-0.068 (0.088)	-0.109 (0.098)
<i>Loan size</i>	0.017 (0.029)	0.032 (0.032)	0.016 (0.029)	0.031 (0.032)	0.071*** (0.027)	0.069** (0.028)	0.072*** (0.027)	0.069** (0.028)
<i>Loan maturity</i>	-0.039 (0.083)	-0.078 (0.090)	-0.046 (0.083)	-0.089 (0.091)	0.078 (0.074)	0.079 (0.080)	0.083 (0.074)	0.087 (0.080)
<i>Loan amendment</i>	-0.081 (0.069)	-0.057 (0.074)	-0.083 (0.069)	-0.058 (0.074)	-0.037 (0.067)	-0.005 (0.068)	-0.035 (0.067)	-0.003 (0.068)
<i>Loan collateral</i>	0.036 (0.093)	-0.002 (0.098)	0.032 (0.093)	-0.005 (0.098)	-0.108 (0.094)	-0.144 (0.099)	-0.104 (0.095)	-0.139 (0.099)
<i>Loan covenant</i>	0.195 (0.119)	0.205* (0.124)	0.179 (0.117)	0.192 (0.123)	-0.126 (0.117)	-0.135 (0.117)	-0.107 (0.119)	-0.115 (0.119)
<i>Revolving tranche</i>	0.005 (0.068)	-0.022 (0.072)	0.007 (0.068)	-0.022 (0.072)	0.051 (0.064)	0.055 (0.068)	0.049 (0.064)	0.053 (0.067)

Table 5 (continued)

<i>Number of KPIs</i>	0.100*** (0.027)	0.120*** (0.029)	0.099*** (0.027)	0.119*** (0.029)	-0.004 (0.024)	-0.007 (0.025)	-0.002 (0.024)	-0.006 (0.025)
<i>Top SLL lender</i>	-0.051 (0.067)	-0.076 (0.072)	-0.055 (0.068)	-0.084 (0.072)	0.236*** (0.067)	0.219*** (0.071)	0.238*** (0.067)	0.220*** (0.072)
<i>Total assets</i>		0.010 (0.022)		0.009 (0.022)		-0.012 (0.019)		-0.012 (0.019)
<i>ROA</i>		2.095*** (0.625)		2.216*** (0.630)		-0.089 (0.609)		-0.153 (0.604)
<i>Leverage</i>		0.228 (0.234)		0.245 (0.231)		0.227 (0.212)		0.221 (0.212)
Observations	388	370	388	370	388	370	388	370
Pseudo R-squared	0.199	0.236	0.199	0.238	0.147	0.155	0.146	0.153
Fixed effects	YES	YES	YES	YES	YES	YES	YES	YES

Table 6. The materiality of sustainability performance targets.

This table reports the results of the tests that corroborate whether the materiality of sustainability performance indicators is related to borrower's ESG risk. In Panel A, in specifications (1) and (2) [(3) and (4)], the dependent variable is *KPI Environmental (Social) indicator*, defined as an indicator variable of whether an SLL includes an environmental (a social) performance indicator. The independent variable of interest is *Environmental (Social) risk*, defined as ten minus the environmental (social) pillar score provided by MSCI. We use a probit model to estimate the specifications and report the marginal effects. In Panel B, in specifications (1) and (2) [(3) and (4)], the dependent variable is *KPI Materiality [KPI Materiality (pct.)]*, defined as an indicator variable of whether an SLL includes an environmental, social or governance target classified as material under the SASB Materiality Map (the ratio of the number of environmental, social or governance targets classified as material under the SASB Materiality Map, deflated by the total number of targets in the SLL). The independent variable of interest is *ESG risk (ESG risk, industry adjusted)*, defined as ten minus a borrower's (industry-adjusted) weighted-average ESG pillar score provided by MSCI. We use a probit model in specifications (1) and (2) and report the marginal effects. We use OLS regressions to estimate specifications (3) and (4). In Panel C, the dependent variable is *KPI GHG emissions /Energy mngmt*, defined as an indicator variable of whether an SLL includes a greenhouse gas emission or energy management target. The independent variable of interest is *Scope 1 and 2 emissions (Scope 1, 2 and 3 emissions)*, defined as the ratio of Scope 1 and 2 (Scope 1, 2 and 3) annual emission volume by a borrower deflated by borrower's total sales. OLS regressions are used to estimate the specifications. Variables are defined in Appendix B. Across all Panels, the values of the continuous variables are winsorized at 1% and 99%. Year of loan origination, borrower's region of incorporation, borrower's GICS industry and loan purpose fixed effects are included but not tabulated. Standard errors are reported in parentheses, corrected for heteroskedasticity and clustered at the borrower level. ***, ** and * denote significance at the 1%, 5% and 10% (two-sided) levels, respectively. Coefficients of interest are in boldface type.

Panel A. Borrower's environmental and social risk and the use of a relevant sustainability performance target.

	(1)	(2)	(3)	(4)
VARIABLES	<i>KPI Environmental indicator</i>		<i>KPI Social indicator</i>	
	<i>ESG = Environmental</i>		<i>ESG = Social</i>	
<i>ESG risk</i>	0.028 (0.019)	0.025 (0.020)	-0.014 (0.012)	-0.016 (0.011)
<i>Public borrower</i>	0.150 (0.100)	0.038 (0.096)	0.013 (0.059)	-0.002 (0.053)
<i>Loan size</i>	0.028 (0.032)	0.040 (0.033)	0.030* (0.017)	0.020 (0.017)
<i>Loan maturity</i>	-0.114 (0.079)	-0.144* (0.082)	-0.042 (0.047)	-0.019 (0.046)
<i>Loan amendment</i>	-0.051 (0.071)	-0.016 (0.075)	-0.043 (0.044)	-0.058 (0.043)
<i>Loan collateral</i>	0.108 (0.097)	0.120 (0.098)	0.035 (0.059)	0.024 (0.057)
<i>Loan covenant</i>	0.206* (0.123)	0.219* (0.125)	-0.001 (0.064)	0.003 (0.061)
<i>Revolving tranche</i>	0.050 (0.065)	0.052 (0.068)	0.026 (0.045)	0.025 (0.042)

Table 6 (continued)

<i>Number of KPIs</i>	0.322*** (0.041)	0.341*** (0.037)	0.161*** (0.023)	0.158*** (0.025)
<i>Top SLL lender</i>	-0.128* (0.072)	-0.124* (0.073)	-0.010 (0.043)	-0.002 (0.040)
<i>Total assets</i>		-0.007 (0.023)		0.012 (0.010)
<i>ROA</i>		1.630** (0.680)		0.093 (0.335)
<i>Leverage</i>		-0.044 (0.250)		-0.017 (0.117)
Observations	388	370	388	370
Pseudo R-squared	0.361	0.381	0.389	0.405
Fixed effects	YES	YES	YES	YES

Table 6 (continued)

Panel B. Borrower's ESG risk and the use of a material sustainability performance indicator based on SASB Materiality Map.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	<i>KPI Materiality</i>				<i>KPI Materiality (pct.)</i>			
<i>ESG risk</i>	0.001	-0.005			-0.015	-0.014		
	(0.038)	(0.039)			(0.025)	(0.023)		
<i>ESG risk, industry adjusted</i>			-0.000	-0.002			0.001	0.001
			(0.016)	(0.017)			(0.010)	(0.010)
<i>Public borrower</i>	-0.022	-0.120	-0.023	-0.119	-0.055	-0.085	-0.049	-0.080
	(0.103)	(0.101)	(0.104)	(0.101)	(0.057)	(0.058)	(0.059)	(0.058)
<i>Loan size</i>	0.005	0.015	0.005	0.015	-0.003	-0.003	-0.002	-0.002
	(0.034)	(0.035)	(0.034)	(0.035)	(0.020)	(0.020)	(0.020)	(0.021)
<i>Loan maturity</i>	0.111	0.116	0.111	0.115	0.019	0.013	0.018	0.012
	(0.083)	(0.093)	(0.083)	(0.094)	(0.043)	(0.045)	(0.043)	(0.045)
<i>Loan amendment</i>	0.066	0.067	0.066	0.067	0.008	0.017	0.006	0.014
	(0.081)	(0.087)	(0.082)	(0.087)	(0.042)	(0.043)	(0.042)	(0.043)
<i>Loan collateral</i>	0.070	0.078	0.070	0.078	0.108*	0.101	0.105	0.100
	(0.106)	(0.111)	(0.106)	(0.111)	(0.064)	(0.067)	(0.064)	(0.067)
<i>Loan covenant</i>	0.162	0.204	0.162	0.202	0.121*	0.144**	0.112*	0.135**
	(0.130)	(0.137)	(0.130)	(0.137)	(0.062)	(0.065)	(0.061)	(0.065)
<i>Revolving tranche</i>	0.004	-0.014	0.004	-0.014	0.010	-0.001	0.013	0.002
	(0.072)	(0.075)	(0.072)	(0.075)	(0.041)	(0.044)	(0.041)	(0.044)
<i>Number of KPIs</i>	0.288***	0.300***	0.288***	0.300***	0.096***	0.099***	0.097***	0.099***
	(0.041)	(0.042)	(0.041)	(0.042)	(0.016)	(0.017)	(0.016)	(0.017)
<i>Top SLL lender</i>	-0.124*	-0.143*	-0.124*	-0.143*	-0.117***	-0.129***	-0.116***	-0.127***
	(0.074)	(0.078)	(0.075)	(0.078)	(0.040)	(0.043)	(0.040)	(0.043)
<i>Total assets</i>		0.007		0.007		0.019		0.019
		(0.022)		(0.022)		(0.013)		(0.013)

Table 6 (continued)

<i>ROA</i>		2.217***		2.225***		1.141***		1.159***
		(0.697)		(0.696)		(0.338)		(0.337)
<i>Leverage</i>		-0.090		-0.089		-0.075		-0.075
		(0.260)		(0.260)		(0.145)		(0.145)
Observations	388	370	388	370	388	370	388	370
(Pseudo) R-squared	0.366	0.386	0.366	0.386	0.393	0.417	0.392	0.417
Fixed effects	YES	YES	YES	YES	YES	YES	YES	YES

Table 6 (continued)**Panel C. Borrower's greenhouse gas emissions and the use of GHG emissions or energy management KPI.**

VARIABLES	(1)	(2)	(3)	(4)
	<i>KPI GHG emissions /Energy mngmt</i>			
<i>Scope 1 and 2 emissions</i>	0.997 (0.857)	0.857 (0.599)		
<i>Scope 1, 2 and 3 emissions</i>			0.570 (0.474)	0.446 (0.429)
<i>Public borrower</i>	0.303 (0.183)	0.122 (0.230)	0.364* (0.194)	0.172 (0.240)
<i>Loan size</i>	-0.014 (0.057)	0.004 (0.051)	-0.028 (0.058)	-0.005 (0.051)
<i>Loan maturity</i>	-0.050 (0.187)	0.015 (0.189)	0.010 (0.200)	0.055 (0.193)
<i>Loan amendment</i>	0.057 (0.118)	0.154 (0.119)	0.090 (0.125)	0.184 (0.126)
<i>Loan collateral</i>	0.234 (0.214)	0.306* (0.166)	0.263 (0.201)	0.332** (0.157)
<i>Loan covenant</i>	-0.200 (0.173)	-0.297 (0.190)	-0.224 (0.172)	-0.319 (0.194)
<i>Revolving tranche</i>	0.102 (0.127)	0.124 (0.106)	0.106 (0.122)	0.124 (0.103)
<i>Number of KPIs</i>	0.210*** (0.044)	0.204*** (0.041)	0.209*** (0.045)	0.204*** (0.041)
<i>Top SLL lender</i>	0.031 (0.123)	0.118 (0.125)	0.033 (0.123)	0.122 (0.127)
<i>Total assets</i>		0.002 (0.021)		-0.000 (0.021)
<i>ROA</i>		-3.394** (1.621)		-3.244** (1.611)
<i>Leverage</i>		-1.565*** (0.388)		-1.563*** (0.392)
Observations	106	100	106	100
R-squared	0.483	0.613	0.485	0.613
Fixed effects	YES	YES	YES	YES

Table 7. Sustainability performance pricing adjustment incentives.

This table reports the results of the tests that corroborate whether the sustainability performance pricing adjustments in sustainability-linked loans (SLL) are related to borrower's ESG risk. In Panel A, *DecRate SPP* is an indicator variable of whether an SLL includes a decreasing one-way sustainability performance pricing. We use a probit model to estimate the specifications and report the marginal effects. In Panel B, in specifications (1)-(4) [(5)-(8)], *SPP Margin adj.* (*SPP Margin adj. range*) is defined as the absolute value of all-in-drawn LIBOR-spread adjustment (range) based on sustainability performance target thresholds. OLS regressions are used to estimate the specifications. Across both panels, the independent variable of interest is *ESG risk* (*ESG risk, industry adjusted*), defined as ten minus a borrower's (industry-adjusted) weighted-average ESG pillar score provided by MSCI. Variables are defined in Appendix B. The values of the continuous variables are winsorized at 1% and 99%. Year of loan origination, borrower's region of incorporation, borrower's GICS industry and loan purpose fixed effects are included but not tabulated. Standard errors are reported in parentheses, corrected for heteroskedasticity and clustered at the borrower level. ***, ** and * denote significance at the 1%, 5% and 10% (two-sided) levels, respectively. Coefficients of interest are in boldface type.

Panel A. Borrower's ESG risk and sustainability pricing incentives.

VARIABLES	(1)	(2)	(3)	(4)
	<i>DecRate SPP</i>			
<i>ESG risk</i>	0.023 (0.024)	0.019 (0.024)		
<i>ESG risk, industry adjusted</i>			0.014 (0.010)	0.015 (0.010)
<i>Public borrower</i>	-0.078 (0.059)	-0.065 (0.064)	-0.076 (0.058)	-0.060 (0.063)
<i>Loan size</i>	-0.005 (0.021)	0.000 (0.022)	-0.003 (0.021)	0.002 (0.022)
<i>Loan maturity</i>	-0.033 (0.051)	-0.012 (0.054)	-0.030 (0.051)	-0.009 (0.054)
<i>Loan amendment</i>	-0.111** (0.050)	-0.115** (0.050)	-0.112** (0.050)	-0.117** (0.050)
<i>Loan collateral</i>	-0.201*** (0.068)	-0.199*** (0.070)	-0.199*** (0.068)	-0.196*** (0.070)
<i>Loan covenant</i>	0.177** (0.075)	0.186** (0.077)	0.174** (0.072)	0.182** (0.074)
<i>Revolving loan</i>	-0.110** (0.051)	-0.109** (0.052)	-0.109** (0.050)	-0.106** (0.051)
<i>Number of KPIs</i>	0.010 (0.018)	0.002 (0.019)	0.011 (0.018)	0.002 (0.019)
<i>Top SLL lender</i>	0.037 (0.049)	0.016 (0.050)	0.037 (0.049)	0.019 (0.050)
<i>Total assets</i>		0.006 (0.013)		0.007 (0.013)
<i>ROA</i>		0.196 (0.454)		0.178 (0.461)
<i>Leverage</i>		-0.036 (0.171)		-0.043 (0.170)
Observations	388	370	388	370
(Pseudo) R-squared	0.315	0.314	0.318	0.318
Fixed effects	YES	YES	YES	YES

Table 7 (continued)

Panel B. Borrower's ESG risk and sustainability pricing adjustments.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	<i>SPP Margin Adj.</i>				<i>SPP Margin Adj. Range</i>			
<i>ESG risk</i>	-0.388	-0.510			-0.401	-0.705		
	(0.378)	(0.427)			(0.729)	(0.812)		
<i>ESG risk, industry adjusted</i>			-0.199	-0.272*			-0.244	-0.402
			(0.145)	(0.163)			(0.288)	(0.319)
<i>Public borrower</i>	0.571	-0.167	0.585	-0.235	0.761	-0.714	0.681	-0.889
	(1.665)	(1.270)	(1.688)	(1.257)	(3.554)	(2.719)	(3.611)	(2.719)
<i>Loan size</i>	-0.702	-0.515	-0.697	-0.528	-1.014	-0.681	-1.021	-0.714
	(0.452)	(0.460)	(0.454)	(0.460)	(0.866)	(0.903)	(0.867)	(0.907)
<i>Loan maturity</i>	1.959**	2.741***	1.844**	2.530***	2.561	3.888**	2.467	3.646*
	(0.880)	(0.898)	(0.904)	(0.908)	(1.830)	(1.893)	(1.878)	(1.969)
<i>Loan amendment</i>	-0.133	-0.187	-0.107	-0.170	-0.185	-0.236	-0.096	-0.154
	(0.583)	(0.526)	(0.591)	(0.532)	(1.329)	(1.232)	(1.355)	(1.241)
<i>Loan collateral</i>	0.223	0.641	0.227	0.602	-0.317	0.423	-0.283	0.399
	(0.607)	(0.624)	(0.602)	(0.638)	(1.175)	(1.309)	(1.171)	(1.340)
<i>Loan covenant</i>	0.279	0.449	0.249	0.460	0.687	1.186	0.619	1.159
	(0.841)	(0.931)	(0.830)	(0.902)	(1.737)	(2.018)	(1.705)	(1.934)
<i>Revolving loan</i>	-3.003*	-2.683*	-2.998*	-2.644*	-6.473*	-6.019*	-6.384*	-5.865
	(1.607)	(1.532)	(1.591)	(1.502)	(3.655)	(3.597)	(3.659)	(3.552)
<i>Number of KPIs</i>	-0.369	-0.597*	-0.394	-0.608*	-1.065	-1.496**	-1.097	-1.509**
	(0.326)	(0.310)	(0.328)	(0.312)	(0.686)	(0.652)	(0.686)	(0.648)
<i>Top SLL lender</i>	0.281	0.511	0.192	0.332	0.364	0.610	0.247	0.347
	(0.572)	(0.658)	(0.598)	(0.712)	(1.039)	(1.261)	(1.066)	(1.337)
<i>Total assets</i>		-0.538***		-0.547***		-1.023***		-1.041***
		(0.172)		(0.177)		(0.340)		(0.342)
<i>ROA</i>		-3.428		-2.169		-1.362		0.556
		(6.788)		(6.841)		(13.651)		(13.850)

Table 7 (continued)

<i>Leverage</i>		0.948 (2.201)		1.536 (2.201)		0.799 (4.037)		1.714 (4.104)
<i>One-Way SPP</i>					-6.004*** (1.951)	-6.005*** (1.964)	-5.837*** (2.016)	-5.780*** (2.018)
Observations	100	98	100	98	100	98	100	98
(Pseudo) R-squared	0.611	0.653	0.615	0.658	0.637	0.669	0.639	0.672
Fixed effects	YES	YES	YES	YES	YES	YES	YES	YES

Table 8. Sustainability performance target slack.

This table reports the descriptive statistics for the slack of sustainability performance targets (SPT) in the sample loans and the results of the tests that examine the association between SPT slack and borrower's ESG risk. *SPT slack* is the mean percentage slack across the sustainability targets in a loan, calculated as $(\text{target score} - \text{target performance}_{y-1}) / \text{target performance}_{y-1}$. We estimate the mean slack of environmental targets (*SPT Environmental slack*), social targets (*SPT Social slack*) and ESG score targets (*SPT ESG score slack*) in a loan. Panel A reports the summary statistics of the SPT slack variables. Panel B reports the mean values of *SPT slack* and *SPT Environmental slack* by borrower region and year of loan origination. Panel C reports the mean values of *SPT slack* and *SPT Environmental slack* (standard errors in parentheses) for loans issued to borrowers of *Low ESG (Environmental) risk* (i.e., borrowers with below-median *ESG (Environmental) risk*) and *High ESG (Environmental) risk* (i.e., borrowers with above-median *ESG (Environmental) risk*). The last column provides t-statistics for the difference in means. In Panel D, we test for the relation between SPT slack and ESG risk. The dependent variables are *SPT slack* and *SPT Environmental slack*. We further control for *KPI classification* (untabulated), defined as one if an SLL includes only restrictive KPIs (e.g., decrease carbon emissions), two if the loan includes restrictive and positive action KPIs, and three if the loan includes only positive action KPIs (e.g., increase board diversity). We use OLS regressions to estimate the models. Standard errors are reported in parentheses, corrected for heteroskedasticity and clustered at the borrower level. ***, ** and * denote significance at the 1%, 5% and 10% (two-sided) levels, respectively.

Panel A. Summary statistics.

VARIABLES	Obs.	Mean	S.D.	Q1	Median	Q3
<i>SPT slack</i>	87	7.380	10.010	2.366	5.310	9.690
<i>SPT Environmental slack</i>	65	8.779	13.428	2.414	5.633	9.885
<i>SPT Social slack</i>	14	9.044	7.596	3.125	7.003	13.144
<i>SPT ESG score slack</i>	21	4.693	10.383	1.800	2.400	5.310

Panel B. SPT slack by borrower region and year of loan origination.

Region	<i>SPT slack</i>	<i>SPT Environmental slack</i>
Asia	2.788	3.351
Europe	9.469	10.025
North America	5.836	7.953
Year	<i>SPT slack</i>	<i>SPT Environmental slack</i>
2018	6.250	6.667
2019	4.181	6.392
2020	6.338	6.038
2021	9.020	10.983

Panel C. SPT slack for borrowers of high and low ESG risk.

VARIABLES	<i>High ESG (Environmental) risk</i>	<i>Low ESG (Environmental) risk</i>	t-stat
<i>SPT slack</i>	7.692 (1.247)	6.768 (1.886)	0.411
<i>SPT Environmental slack</i>	9.541 (2.501)	8.216 (2.618)	0.366

Table 8 (continued)**Panel D. SPT slack and borrowers' ESG risk.**

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	<i>SPT Slack</i>			<i>SPT Environmental slack</i>		
<i>ESG risk</i>	0.904	1.080				
	(1.782)	(1.767)				
<i>ESG risk, industry adjusted</i>			-0.570	-0.560		
			(0.667)	(0.675)		
<i>Environmental risk</i>					-0.019	-0.493
					(2.316)	(2.337)
<i>Public borrower</i>		-1.611	-2.866	-5.080	-3.940	-2.097
		(7.377)	(7.048)	(7.402)	(10.416)	(13.976)
<i>Loan size</i>	-1.034	-0.704	-1.113	-0.601	1.225	3.036
	(1.362)	(1.613)	(1.338)	(1.540)	(2.159)	(2.585)
<i>Loan maturity</i>	3.718	4.423	3.078	3.563	4.700	2.990
	(3.391)	(4.080)	(3.363)	(4.131)	(5.097)	(5.124)
<i>Loan amendment</i>	-3.020	-3.014	-1.947	-1.720	-2.981	-3.883
	(2.823)	(3.185)	(2.845)	(3.255)	(5.259)	(6.355)
<i>Loan collateral</i>	4.170	5.669	5.060	6.931	1.759	5.080
	(3.765)	(4.508)	(3.883)	(4.616)	(7.415)	(8.499)
<i>Loan covenant</i>	0.767	-0.675	-0.522	-2.090	-5.950	-10.479
	(5.455)	(5.706)	(5.209)	(5.751)	(6.123)	(9.723)
<i>Revolving tranche</i>	0.277	0.427	0.169	-0.047	2.215	2.483
	(3.760)	(4.045)	(3.877)	(4.009)	(4.867)	(4.838)
<i>Number of KPIs</i>	2.571*	2.724*	2.352	2.360	1.134	2.170
	(1.482)	(1.568)	(1.412)	(1.487)	(2.027)	(1.933)
<i>Top SLL lender</i>	4.157	4.956	3.546	4.370	-5.185	-6.427
	(3.862)	(4.187)	(3.636)	(4.090)	(7.621)	(8.875)
<i>Total assets</i>		-0.016		-0.319		-1.536
		(0.858)		(0.828)		(1.354)
<i>ROA</i>		-25.346		-26.786		-24.930
		(36.766)		(39.236)		(52.830)
<i>Leverage</i>		-4.306		-1.824		19.533
		(10.531)		(10.333)		(15.973)
Observations	77	77	77	77	57	57
R-squared	0.485	0.501	0.490	0.504	0.536	0.606
Fixed effects	YES	YES	YES	YES	YES	YES

Table 9. Sustainability performance pricing provision and the use of environmental covenants.

This table reports the results of the tests that examine the use of environmental covenant in sustainability-linked loans (SLLs). The dependent variable is *KPI Environmental indicator*, defined as an indicator variable of whether an SLL includes an environmental performance target. The independent variable of interest is *Environmental covenant*, defined as an indicator variable of whether an SLL includes an environmental covenant. Variables are defined in Appendix B. The values of the continuous variables are winsorized at 1% and 99%. Year of loan origination, borrower's region of incorporation, borrower's GICS industry and loan purpose fixed effects are included but not tabulated. We use OLS regressions to estimate the models. Standard errors are reported in parentheses, corrected for heteroskedasticity and clustered at the borrower level. ***, ** and * denote significance at the 1%, 5% and 10% (two-sided) levels, respectively. Coefficients of interest are in boldface type.

VARIABLES	(1)	(2)
	<i>KPI Environmental indicator</i>	
<i>Environmental covenant</i>	0.591*** (0.123)	0.456*** (0.126)
<i>Loan size</i>	0.089 (0.076)	0.082 (0.064)
<i>Loan maturity</i>	-0.298* (0.153)	-0.300 (0.198)
<i>Loan amendment</i>	-0.075 (0.099)	-0.149 (0.100)
<i>Loan collateral</i>	0.173 (0.128)	0.214 (0.141)
<i>Loan covenant</i>	0.007 (0.138)	0.008 (0.100)
<i>Revolving tranche</i>	-0.010 (0.246)	-0.064 (0.231)
<i>Number of KPIs</i>	0.221*** (0.078)	0.252*** (0.073)
<i>Top SLL lender</i>	0.161 (0.121)	0.081 (0.119)
<i>Total assets</i>		-0.033 (0.049)
<i>ROA</i>		1.370* (0.731)
<i>Leverage</i>		0.871** (0.404)
Observations	65	65
R-squared	0.650	0.732
Fixed effects	YES	YES